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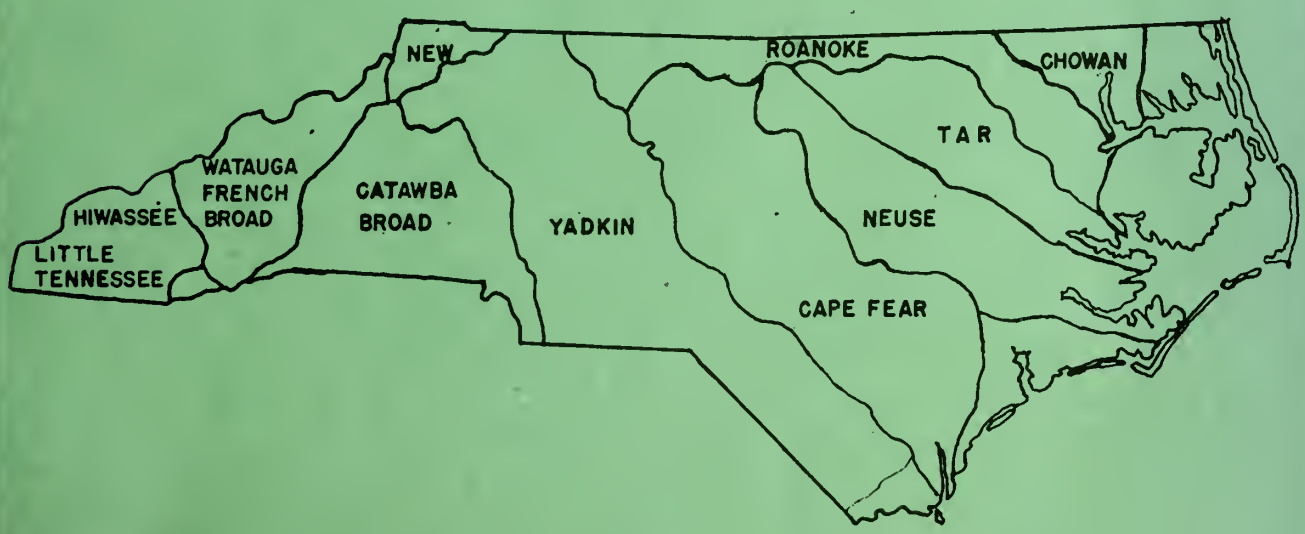
V. VII

WATER RESOURCES OF NORTH CAROLINA
CAPE FEAR RIVER BASIN



RALEIGH

1958

FOREWORD

This publication comprises Volume VII of a series of twelve volumes containing information regarding water resources of North Carolina. Volumes I to VI, inclusive, were published as follows:

I State as a whole, January 1955
II Neuse River Basin, May 1955
III Yadkin-Pee Dee River Basin, August 1955
IV Chowan River Basin, December 1955
V Roanoke River Basin, February 1957
VI French Broad River Basin, November, 1957.

Volumes VIII-XII, inclusive, will provide inventories of the Broad and Catawba, Tar-Pamlico, Hiwassee and Little Tennessee, Kanawha and Watauga, and Coastal Plain River Basins. Draft of inventory of water resources of the Broad and Catawba River Basins is substantially completed, and considerable progress on drafts of the four other inventories has been made. When the contemplated series are completed, probably by the end of 1959, information pertaining to the entire State will be available to assist in the orderly planning and development of the water facilities required for municipal and industrial expansion and for expansion of the uses of water for agriculture, and to guide watershed authorities, basin associations, soil conservation districts, and other agencies concerned with water uses in accomplishing their purposes.

It is hoped that this publication will assist in the location, development, and expansion of municipal, industrial, agricultural, and other water supplies, and serve as a guide to the future study of water resources in the Cape Fear River Basin.

Grateful appreciation is hereby extended to persons who provided material for this volume as follows:

Chapter I - North Carolina State Planning Board, Corps of Engineers, U. S. Army, and Almanac Publishing Company, Raleigh, North Carolina.

Chapter II - Geological Survey, U. S. Department of the Interior.

Chapter III - Almanac Publishing Company.

Chapter IV - Geological Survey, U. S. Department of the Interior.

Chapter V - National Resources Committee and Corps of Engineers, U. S. Army.

Chapter VI - Geological Survey, U. S. Department of the Interior.

Chapter VII - Geological Survey, U. S. Department of the Interior.

Chapter VIII - Geological Survey, U. S. Department of the Interior.

Chapter IX - North Carolina State Stream Sanitation Committee.

Chapter X - Soil Conservation Service, U. S. Department of Agriculture.

Chapter XI - Corps of Engineers, U. S. Army.

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CHAPTER I - DESCRIPTION OF WATERSHED

Main Stream - The Cape Fear River is formed by the confluence of the Deep and Haw Rivers on the Chatham-Lee County Line about 2.5 miles south of the Town of Moncure. It flows thence in a generally southeasterly direction across the "fall zone" and Sand Hill region, and for the greater portion of its length through the Coastal Plain. From its source, it runs along the Chatham-Lee County Line until it enters Harnett County; thence through Harnett County generally parallel to, and from 10 to 15 miles from, the divide between the Cape Fear and Neuse River Basins until it enters Cumberland County, thence in a generally southwesterly direction in Cumberland County with several sharp bends, until it enters Bladen County about five miles from the divide between the Cape Fear and Yadkin-Pee Dee River Basins; thence in a generally southeasterly direction in Bladen County, approximately parallel to, and from one to ten miles from, the divide between the Cape Fear and Yadkin-Pee Dee River Basins until it leaves Bladen County at the point at which it becomes the boundary between Columbus and Pender Counties; thence successively along the Columbus-Pender, Brunswick-Pender, and Brunswick-New Hanover County Lines until it empties into the Atlantic Ocean between Fort Caswell and Smith Island.

The drainage area of the main stream at its beginning is 3,150 square miles. The total length of the Cape Fear River, including the Deep River, is approximately 320 miles. The total area of its watershed is about 8,570 square miles, its basin being the largest of any stream lying wholly within the State of North Carolina.

The drainage basin of the Cape Fear River is oblong in shape, its greatest width being about 60 miles. The length of the area is about 200 miles. The main stream and its principal tributary, the Haw River, flow comparatively close to the northern boundary of the watershed above the lower boundary of the "fall zone". Through this reach, the larger tributaries drain territory to the west and south. Below the "fall zone", the main stream makes a decided curve to the southwest, and, below the mouth of Rockfish Creek, it flows very near to the southern divide (the divide between the Cape Fear and Yadkin-Pee Dee River Basins). Due to this fact, the more important lower tributaries join the main stream from the left bank.

Tributaries - The principal tributaries of the Cape Fear River, in addition to its source tributaries, the Deep and Haw Rivers, are Northeast River, or Northeast Cape Fear River, as it is also called, Black River, Rockfish Creek, and Lower Little River.

Northeast River, or Northeast Cape Fear River, is the largest tributary of the Cape Fear River and the first tributary of importance as the stream is ascended. It rises in Duplin County about two miles southeast of the Town of Mt. Olive in Wayne County, forms the boundary between Wayne and Duplin Counties until it enters Duplin County about ten miles southeast of Mr. Olive, flows in Duplin County in a generally southerly direction until it enters Pender County about four miles southeast of the Town of Wallace, flows in a generally southerly direction in Pender County until it becomes the boundary between Pender and New Hanover Counties, flows along that boundary to a point about six miles north of the City of Wilmington, and flows thence in New Hanover County in a generally southerly direction until it joins the Cape Fear River near the northwest corner of the City of Wilmington.

Black River, another important tributary of the Cape Fear River, is formed by the confluence of Little and Great Coharie Creeks in Sampson County about nine miles southwest of the Town of Clinton. The sources of these creeks are in the northern part of Sampson County. In addition to these creeks, it has one other important tributary, the South River, which, with its tributary, Mingo Swamp, forms successively the Harnett-Johnston, Harnett-Sampson, Cumberland-Sampson, and Bladen-Sampson County Lines until it joins the Black River about two miles northwest of the Sampson-Pender County Line. The Black River flows in a southerly direction in Sampson County, forms successively the Bladen-Sampson and Bladen-Pender County Lines below its confluence with the South River, and flows in a generally southeasterly direction in the southwestern part of Pender County until it joins the Cape Fear River from the left bank about 14 miles above Wilmington. Most of the territory drained by the Black River lies in the Coastal Plain, only the South River extending into the "fall zone", a region some 30 to 40 miles in width which forms the boundary between the Piedmont Plateau and the Coastal Plain. The elevation of the source of the Black River is approximately 200 feet above mean tide. The South River extends to an altitude of about 400 feet. The Black River joins the Cape Fear River at slightly above sea level, and has a tidal reach which extends up its channel for about 24 miles. The fall of the stream throughout is uniform. The basin drained by the Black River has an area of approximately 1,410 square miles.

Rockfish Creek, an important tributary of the Cape Fear River because of its developed power, rises in the "Sand Hill" region of Moore County near the Town of Southern Pines. The "Sand Hill" region is a subdivision of the Coastal Plain, bordering on the Piedmont Plateau and so named for its rolling hills. Rockfish Creek flows in a generally easterly direction, being joined by its principal tributary, Little Rockfish Creek, a short distance above its mouth. It empties into the Cape Fear River about six miles below Fayetteville. The elevation of the source of the stream is about 500 feet, and of its mouth 21 feet, above mean sea level. This stream has an unusually uniform flow and gradient. The total area of Rockfish Creek is 303 square miles.

Lower Little River is also an important tributary of the Cape Fear River from the standpoint of power development. It rises in the southwestern part of Moore County near the divide between the Yadkin-Pee Dee and Cape Fear River Basins, and flows in an easterly direction through Moore County, forms the northern boundary of Fort Bragg Military Reservation in Hoke and Cumberland Counties, and flows along the Harnett-Cumberland County Line until it enters the Cape Fear River about 2.5 miles east of the Town of Linden in Cumberland County. Its length is about twice that of the Upper Little River, which rises in Lee County about two miles northwest of Lemon Springs and flows in a generally southeasterly direction through the south-central part of Harnett County until it enters the Cape Fear River about 1.5 miles west of the Town of Erwin. The source of Lower Little River is in the same locality as that of the source of Rockfish Creek. The elevation of its source is approximately the same as that of Rockfish Creek (about 500 feet), it has a gradient and flow similar to that of Rockfish Creek, and it empties into the main stream at an elevation of about 50 feet. Lower Little River drains an area of 477 square miles.

Deep River, the lesser of the two source tributaries of the Cape Fear River, rises on the boundary between Forsyth and Guilford Counties; flows in a southeasterly direction through the southwestern part of Guilford County and in the northern part of Randolph County; flows easterly in Randolph County through Central Falls, Cedar Falls, Franklinville, and Ramseur, and wouth-erly in Randolph County through Coleridge until it crosses the Randolph-Moore County Line; flows easterly in the northeastern corner of Moore County; and forms successively the Moore-Lee County Line and the Chatham-Lee County Line until it joins the Haw River to form the Cape Fear River. The elevations of the source and the mouth of Deep River are approximately 1000 and 58 feet, respectively. The stream has a very steep gradient, and throughout its length there are numerous falls and rapids. Its only important tributary is Rocky River which rises in the northeastern part of Randolph County about one mile northwest of the Town of Liberty, flows for a short distance in the southwestern corner of Alamance County until it joins the Deep River on the Chatham-Lee County Line about seven miles south of the Town of Pittsboro. The total drainage area of the Deep River is approximately 1,390 square miles.

Haw River, the principal source tributary of the Cape Fear River, rises in Guilford County near the Forsyth-Guilford County Line, flows northeasterly in the northwestern corner of Guilford County, easterly in Rockingham County generally parallel to the Rockingham-Guilford County Line and from zero to two miles north thereof, southeasterly in the northeast corner of Guilford County, generally southeasterly through Alamance County to the southeast corner thereof, and southeasterly through Chatham County to its junction with the Deep River. The elevation of the source of the Haw River is approximately the same as that of the Deep River (1000 feet). The Haw River also has a very steep gradient, the fall of the stream near its mouth being much greater than that in the corresponding section of the Deep River. Its only important tributary is New Hope River which rises in Orange County about four miles south of the Town of Hillsboro, flows easterly in Orange County through Duke Forest, southerly in the southwest corner of Durham County, and southerly in Chatham County, generally parallel to the Chatham-Wake County Line and from three to five miles therefrom, until it joins the Haw River about four miles above the confluence of the Haw and Deep Rivers. New Hope River is known as New Hope Creek above the junction of Northeast Creek and New Hope River, about 2.5 miles northeast of the Town of Farrington in the northeast corner of Chatham County. The total drainage area of the Haw River is 1,760 square miles.

Relation of the Cape Fear River to Other Important Streams - The Cape Fear River has a course practically parallel to those of the Neuse River to the northeast and the Yadkin-Pee Dee system to the southwest. The Cape Fear River Basin borders the Roanoke River Basin in the northwestern part of Forsyth County, the northwestern corner of Guilford County, and the southern and southwestern parts of Rockingham County and Caswell County, respectively.

Gradient of the Stream - The gradient of the Cape Fear River is shown in the following table.

Reach	Decrease in elevation, feet
Futhermost source to Buckhorn Falls	840
Buckhorn Falls (about 8 miles SE of Moncure)	21
Buckhorn Falls to Smiley Falls (about 1 mile NW of Lillington)	47

Smiley Falls to Fayetteville	30
Fayetteville to mouth of Cape Fear River	21
	998

The average fall per mile of the Cape Fear River below the tail water of Lock and Dam No. 1 at Kings Bluff in Bladen County, 23 miles southeast of Elizabethtown, is 0.02 feet per mile. As has been previously stated, the gradients of the Cape Fear's two source tributaries, the Deep and Haw Rivers, are very steep, consisting largely of a series of pools, rapids, and falls. The gradient of the main stream through the "fall zone", which it leaves near the mouth of Lower Little River, about 2.5 miles east of the Town of Linden in Cumberland County, is similar to those of its two source tributaries. Below this zone, the characteristics of the main stream change, and it becomes a typical coastal stream with a flat gradient. The fall of the stream is regulated by the Federal Government's navigation dams at Tolar's Landing, Elizabethtown, and Kings Bluff in the northwestern, central, and southeastern parts of Bladen County, respectively. The tidal reach of the Cape Fear River extends from the mouth of the stream up its channel for about 70 miles.

Principal Cities and Towns -- The ten largest municipalities in the Cape Fear River Basin are shown in the following table.

Municipality	County	Population 1930	1940	1950
Greensboro	Guilford	53,569	59,319	74,339
Durham	Durham	52,037	60,195	71,311
Wilmington	New Hanover	32,167	33,407	45,043
High Point	Guilford	36,708	38,495	39,973
Fayetteville	Cumberland	13,115	17,428	34,715
Burlington	Alamance	9,737	12,198	24,560
Reidsville	Rockingham	6,833	10,387	11,708
Sanford	Lee	4,250	4,960	10,013
Asheboro	Randolph	5,000	6,981	7,701
Dunn	Harnett	4,561	5,256	6,316

Vital Statistics of Counties-- The population and growth of counties within or partially within the basin, are as follows:

County	Population 1940	1950
Alamance	57,427	71,220
Bladen	27,156	29,703
Brunswick	17,125	19,238
Caswell	20,032	20,870
Chatham	24,726	25,392
Cumberland	59,320	96,006
Duplin	39,739	41,074
Durham	80,244	101,639
Guilford	153,916	191,057
Harnett	44,239	47,605
Hoke	14,937	15,756

Lee	18,743	23,522
Moore	30,969	33,129
New Hanover	47,935	63,272
Orange	23,072	34,435
Pender	17,710	18,423
Randolph	44,554	50,804
Rockingham	57,898	64,816
Sampson	47,440	49,780

Topography— The topography of the Cape Fear River Basin may be considered in three physical divisions, known locally as the Piedmont Plateau, the Sand Hill Region, and the Coastal Plain. The Sand Hill Region is in reality a part of the Coastal Plain. Because of its distinctive characteristics, however, it can be more conveniently considered separately.

The Piedmont Plateau consists largely of rolling hills and deeply-eroded valleys, the tops of the hills being the remnants of a former peneplain. This region extends from the sources of the Cape Fear River and beyond to a northeast-southwest line defined roughly by the main line of the Seaboard Air Line Railroad. The elevation of the Piedmont Plateau varies in the Cape Fear River Basin from 1,000 feet at the headwaters of the stream to 300 feet where it merges into the Sand Hill Region. Most of the reservoir and power sites are found on the Piedmont Plateau.

The Sand Hill Region, so named because of its rolling sand hills, is a wedge-shaped area sandwiched between the Piedmont Plateau and the Coastal Plain proper. This physical division of the Cape Fear River Basin lies principally between the main lines of the Seaboard Air Line and Atlantic Coast Line Railroads. Its general elevation varies from 300 to 150 feet above sea level. This belt is much more undulating than the Piedmont Plateau and its drains are comparatively shallow, only the main stream having cut through the softer deposits to the basement rocks. Few sites for sizeable dams exist in this area.

The remainder of the Cape Fear River Basin is embraced in the Coastal Plain proper. This region is gently rolling in places. In general, however, it is comparatively flat. The stream valleys are wide, with much overflow and marshland. Because of these features, practically no reservoir nor power sites are available in the Coastal Plain.

Geology— The surface mantle of the Piedmont Plateau consists largely of soils of slate or granite origin, the principal types being composed of sand and clay in varying mixtures. The top soils are usually shallow and are underlain by slate, quartz, and granite, or other igneous materials. The larger streams have, in general, cut their beds down to the base rocks, which are composed of granite. Faults and fractures of the earth's surface are unusual in this region. Good foundations for dams of great weight exist almost universally throughout this area. Impounding reservoirs here should be capable of holding water without danger of large seepage losses through subterranean fissures. Grouting would, however, be necessary to close surface cracks in dam foundations.

The Sand Hill Region is composed largely of surface soils of sand and gravel, which are probably the remains of an ancient shore line. This physical division of the Cape Fear River Basin, in its contact with the Pied-

mont Plateau, grades off into a sandstone belt which contains seams of shale and coal. The whole is underlain by igneous formations known as the basement rocks. The depth to these rocks increases toward the coast, their general dip being in that direction. Several parallel faults running in a northwest-southeast direction have been mapped along the western boundary of this region. Good dam foundations exist at points where the basement rocks can be encountered at reasonable depths. Where these rocks lie too low below the stream beds to place a dam thereon, poor foundation conditions for heavy structures are found. Reservoirs through this region would doubtless lose considerable quantities of water through seepage when first constructed. However, as silt would soon become deposited in an impervious layer on their floors, such losses would decrease materially in time.

The Coastal Plain is composed largely of sand and marine deposits of recent origin. High dams in the area below the "fall zone" must necessarily be of the reinforced concrete, earth, or rockfill type, as poor foundations for heavy structures exist. The same situation exists here as in the Sand Hill Region regarding seepage losses from large impounding reservoirs.

Forest Cover-- The watershed of the Cape Fear River was formerly forested with virgin stands of hardwoods and pines. Of the original forest cover, little pine remains, and the supply of hardwoods in commercial quantities has also been largely exhausted. However, much of this area, which was once cleared and cultivated, has been allowed to revert to forests, the second growth consisting largely of shortleaf pine. It is estimated that 70 percent of the entire basin is wooded. Only about 45 percent is heavily forested. The principal species of timber found are oak, hickory, ash, gum, cedar, cypress, and several varieties of pine, the shortleaf type largely predominating.

General Information regarding Counties within or partially within the Cape Fear River Basin

Alamance County--A northern Piedmont county, Alamance is rolling with low mountains in the southern section. Clays for bricks are the principal mineral resources. A pyrophyllite deposit which has not been developed, occurs. Chief merchantable timbers are second-growth pine and some oak. Waters include the Haw River, numerous creeks, and headwaters of the Cape Fear River.

A prosperous farm area, tobacco is the chief crop, followed by corn and hay. Dairying in the county is three times as important as for the State as a whole. The county is highly industrialized, ranking sixth in manufactured products mostly hosiery and textiles. The county has over 145 manufacturing establishments. Burlington is a primary trucking center and tobacco auction market.

Communities include Graham (county seat), Burlington, Haw River, Mebane, Elon College, Alamance, and Glen Raven.

Rainfall (inches)	41.14
Snowfall (inches)	9.7
Tobacco (1952 Val.)	$1,800,000
Corn (1952 Val.)	$500,000

Hay (1952 Val.)	$400,000
Total Land Area (acres)	277,760
Forest Area (acres)	138,700
Total Tax Val.	$125,000,000
Tax Rate	$1.30

Bladen County - In the Sandhills-Coastal region, Bladen is level with considerable swampland. One of the most heavily forested counties, the Bladen Lake State Forest constitutes a 45,000 acre preserve. Principal merchantable species are pine, gum, and cypress. Waters include the Cape Fear, South, and Black Rivers; Singletary, Little Singletary, Black, White, Jones, Baker's, Pages', and Salters Lakes; and Phillips, Harrison, Ellis, Turnbull, and Colly Creeks. The lakes are said to have been formed by the impact of meteorites on the earth's surface.

Mainly agricultural, tobacco, corn, and peanuts are the chief cash crops. Other crops include cotton, Irish and sweet potatoes, and hay and other feed crops. Extensive logging is carried on, and lumbering is the chief industry. Considerable timber is cut for ties and veneer.

Communities include Elizabethtown (county seat), Bladenboro, Clarkton, Abbottsburg, Elkton, Porterville, Rosindale, Councils, Kelly, Lagoon, Guyton, Berwick, Dublin, Perth, and Tar Heel.

Rainfall (inches)	43.95
Snowfall (inches)	4.0
Mean annual temperature	46.20
Tobacco (1951 Val.)	$8,561,100
Corn (1951 Val.)	$1,499,540
Peanuts (1951 Val.)	$807,020
Total Land Area (acres)	562,560
Forest Area (acres)	516,800
Total Tax Val.	$24,062,315
Tax Rate	$1.30

Brunswick County - The most southeasterly county in the State, Brunswick borders on the Atlantic Ocean and South Carolina, in addition to Columbus, Pender and Hanover Counties. Its land is low and swampy. Much of the forest in large tracts is held by the Riegal Paper Company and the International Paper Company. Second-growth pine is coming back rapidly. Waters include the Cape Fear, Brunswick, and Elizabeth Rivers, Orton Pond, and Hood, Sturgeon, Jackson, and Town Creeks. Town Creek and its numerous tributaries drain a large area in the eastern part of the county.

A very small percentage of the land is in cultivation, and potatoes, corn, and tobacco are the chief crops, though flowers, truck crops, small grains, tomatoes, blue berries, and early plants for later transplanting are being introduced. Lumbering is the chief occupation in terms of employment. Southport is one of the leading shipping points for shrimp, clams, and other food fish. It is also a center for the menhaden fleet.

Communities include Southport (county seat), Shallotte, Winnabow, Leland, and Supply.

Rainfall (inches)	49.03
Snowfall (inches)	1.8
Mean annual temperature	63.4
Growing season (days)	245
Tobacco (1951 Val.)	$3,250,000
Corn (1951 Val.)	$497,950
Hay (1951 Val.)	$211,240
Total Land Area (acres)	558,720
Forest Area (acres)	427,200
Total Tax Val.	$14,356,013
Tax Rate	$1.80

Caswell County - A North Piedmont County, Caswell borders on Virginia. Large deposits of gneissic granite occur near Pelham, and a large deposit of well-banded gneiss is found on U. S. Highway 158 east of Yanceyville. Merchantable species of timber include shortleaf pine and oak. Waters in the Cape Fear River Basin consist of headwaters of Buttermilk Creek, a tributary of the Haw River.

A large part of the land area is in farms, tobacco being the chief crop. The county is the birthplace of bright leaf tobacco, and its cultivation spread throughout the Piedmont Plateau, forming what is known as the Old Bright Belt. Other farm products include corn, vegetables, hay, wheat, hogs, and sweet potatoes. Industrial activity is confined to sawmills, planing mills, and a few textile plants. Hosiery is manufactured at Yanceyville.

Communities include Yanceyville (county seat), Milton, Ridgeville, Prospect Hill, Pelham, Blanche, Leasburg, Purley, Topnot, Corbett, Gatewood, Fitch, Milesville, and Providence.

Rainfall (inches)	43.86
Snowfall (inches)	11.4
Mean annual temperature	58.9
Growing season (days)	203
Tobacco (1951 Val.)	$8,246,970
Corn (1951 Val.)	$778,720
Hay (1951 Val.)	$605,770
Total Land Area (acres)	278,400
Forest Area (acres)	109,000
Total Tax Val.	$12,062,860
Tax Rate	$1.75

Chatham County - In the eastern Piedmont and near the center of the State, Chatham is hilly with some small mountains, sharing some of the characteristics of the Sand Hills Region. Minerals found are gold, copper, a good deposit of bituminous coal, shale, sandstone, brick and tile clays, manganiferous iron, and diabese. Chief merchantable timbers are shortleaf and loblolly pine, and oak. There are some original hardwoods, with black jack and post oak types. Waters include the Haw, Deep, Rocky, and New Hope Rivers, and numerous creeks. Hydroelectric power plants are located on the Deep River.

Largely agricultural, tobacco is the chief crop, followed by corn and wheat. Raising of poultry, sheep, beef cattle, dairy cows, hogs, and honey is important. A poultry-feed mill at Siler City has been largely responsible for the poultry complexion of the county, and here also is one of

the largest poultry processing plants in the State. The county ranks first in North Carolina in broiler production. Textile plants at Siler City, Pittsboro, and Bynum form the leading industries of the county. A furniture manufacturing center is located at Siler City. Sawmills are scattered throughout the area.

Communities include Pittsboro (county seat), Siler City, Goldston, Bennett, Bonlee, Gulf, Bynum, Haywood, Merry Oaks, Farrington, Moncure, and Brick Haven.

Rainfall (inches)	44.35
Snowfall (inches)	6.6
Mean annual temperature	58.9
Growing season (days)	191
Wheat (1951 Val.)	$703,030
Tobacco (1951 Val.)	$2,600,080
Corn (1951 Val.) Est.	$909,930
Total Land Area (acres)	452,480
Forest Area (acres)	274,600
Total Tax Val.	$31,000,000
Tax Rate	$1.16

Cumberland County - A county lying in both the Sand Hills Region and the Coastal Plain, Cumberland has both uplands and swamps. Brick and tile clays, sand, and gravel are found. Merchantable species of timber are pine, sweet gum, black gum, cypress, and others. Waters include the Cape Fear, South, and Little Rivers, Rockfish Creek, and numerous smaller creeks.

Tobacco, corn, and cotton are the chief crops. Fayetteville has a tobacco market and is an important point on the main line of the Atlantic Coast Line Railroad. There is some cultivation of fruit and vegetables. Industrial diversification is wide, a large part of it reflecting service enterprises. Textile mills, lumber, and timber basic products are the largest industries. Others include furniture, food, cotton-seed processing, fertilizer, brick, concrete, and stone companies.

The Fort Bragg Military Reservation, lying in both Cumberland and Hoke Counties, is the largest in the United States. Fort Bragg, largest artillery post in the world, is near Fayetteville. A State Fish and Game Farm is located on Lake Rim. The State Normal School for Negroes at Fayetteville is the oldest normal school in the State.

Communities include Fayetteville (county seat), Victory, Hope Mills, Wade, Stedman, Linden, Falcon, and Godwin.

Rainfall (inches)	47.15
Snowfall (inches)	5.1
Mean annual temperature	63.2
Growing season (days)	222
Tobacco (1952 Val.)	$3,900,000
Corn (1952 Val.)	$1,200,000
Cotton (1952 Val.)	$2,400,000
Total Land Area (acres)	423,040
Forest Area (acres)	284,400
Total Tax Val.	$85,000,000
Tax Rate	$1.05

Duplin County - In the southern Coastal section, Duplin is low with some swamplands. Principal merchantable species of timber are pine and gum. Duplin is one of the largest lumbering counties in the State. Waters include the Northeast Cape Fear River and numerous creeks.

The county is a rich agricultural region. Tobacco is the chief cash crop. The county is one of the most extensive truck-farming areas in the State. Irish and sweet potatoes, cucumbers, string beans, peas, and mixed vegetables are shipped in large quantities, in addition to strawberries, watermelons, and cantaloupes. Corn, cotton, and hay are important. Warsaw, Faison, and Wallace are truck-market centers. Faison is one of the largest cucumber markets in the world. Wallace is the marketing center for a large strawberry-growing area, and a tobacco auction and warehouse town. Lumbering and pickle manufactures are the leading industries. At Faison, cucumbers, cauliflower, onions, and sweet peppers are made into pickles. A cabinet-making factory is located at Magnolia. Plants at Magnolia and Wallace manufacture wooden boxes and crates for shipping vegetables and fruits. Other industries include fruit and vegetable packing, flour and feed mills, and tobacco processing. A coffin factory is located at Rose Hill. An annual Strawberry Festival is held in May at Wallace, and a Farmers Day Celebration occurs each fall in Warsaw.

Communities, in addition to thos indicated above, include Kenansville (county seat), Calypso, Beulaville, Chinquapin, Teachey, Bowden, and Tin City.

Rainfall (inches)	50.39
Snowfall (inches)	3.3
Mean annual temperature	61.8
Growing season (days)	208
Tobacco (1951 Val.)	$20,142,060
Corn (1951 Val.)	$3,571,310
Cotton (1951 Val.)	$1,038,240
Total Land Area (acres)	526,080
Forest Area (acres)	334,200
Total Tax Val.	$35,212,251
Tax Rate	$1.50

Durham County - In the north central Piedmont, Durham is rolling and fertile. There are good brick and tile clays in the county which is underlain with a belt of Triassic sandstone. Chief merchantable species in forests are shortleaf and loblolly pine, oak, hickory, sweet gum, and poplar. Waters in the Cape Fear River Basin are in the southwest part of the county and include New Hope Creek and Northeast Creek, tributaries of New Hope River. The greater part of Durham County lies in the Neuse River Basin.

Tobacco is the leading cash crop and there are 10 tobacco-auction warehouses in the City of Durham. Corn and other grains, sweet potatoes, hay, and some cotton are also grown. The City of Durham, with its fabulous tobacco empire including factories of the American Tobacco Company and Liggett & Myers Tobacco Company, has huge textile mills, and is a large shopping and educational center. Industries include textile and hosiery mills, lumbering, and manufacture of furniture, boxes, chemicals, stone products, and packing machinery. In the City of Durham, Negroes operate a college, business firms (including banks and the largest Negro Insurance Company in the world), schools, a newspaper, a library, and a hospital.

Duke University, originally Trinity College and heavily endowed in 1924 by James B. Duke, and the North Carolina College for Negroes are located at Durham. The city is a medical center, consisting of a Veterans Administration Hospital, Duke University Hospital, Watts Hospital, and Lincoln Hospital (a State institution). Camp Butner, ten miles northeast of Durham and used as a military training center during World War II, has been converted into a State Mental Hospital, which has a vocational school and produces livestock for all state institutions.

Communities include Durham (county seat), Rougemont, Brassfield, and Bahama.

Rainfall (inches)	40.97
Snowfall (inches)	8.6
Mean annual temperature	58.9
Growing season (days)	201
Tobacco (1952 Val.)	$2,450,000
Hay (1952 Val.)	$280,000
Corn (1952 Val.)	$350,000
Total Land Area (acres)	191,360
Forest Area (acres)	124,100
Total Tax Val.	$266,872,405
Tax Rate (lowest in the State)	$0.67

Guilford County-- Guilford is centrally located in the industrial Piedmont, and its land is rolling. Low-grade, gold-bearing copper ores occur in the county. Titaniferous magnetite-iron ores are also found. Waters include the Deep and Haw Rivers, several lakes, and numerous creeks.

Tobacco is the chief cash crop. A large corn crop is marketed chiefly as feed for livestock, and vegetables and grains are grown mainly for home consumption. Dairying is the principal livestock industry. Textiles comprise the leading industry in the county, followed by manufacture of furniture, centered at High Point. Other industries include food, tobacco, lumber, paper, chemicals, leather, machinery, iron, automobile, and other manufactures. The southeastern part of the county is a large lumber producer. Ties and veneer logs are cut, and there are plywood and planing mills. Stone, clay, and glass products are made, and a number of manufactures utilize iron and steel.

Guilford County is an educational center. Greensboro College, Woman's College of the University of North Carolina, the Immanuel Lutheran College and Theological Seminary, the Agricultural and Technical College of North Carolina (Negro), and Bennett College for Negro Women are located at Greensboro, the county seat. Near Greensboro is Guilford College, oldest and most influential Quaker College in the South. At High Point is High Point College, a Methodist institution, and a military institute is located at Oak Ridge.

Communities, in addition to those indicated above, include Jamestown, Sledgefield, Stokesdale, Summerfield, Monticello, Gibsonville, McLeansville, and Pleasant Garden.

Rainfall (inches)	47.5
Snowfall (inches)	7.1
Mean annual temperature	57.3
Growing season (days)	189

Tobacco (1951 Val.)	$7,045,110
Corn (1951 Val.)	$1,149,390
Hay (1951 Val.)	$1,182,900
Total Land Area (acres)	416,640
Forest Area (acres)	191,300
Total Tax Val. (largest in the State)	$533,000,000
Tax Rate	$0.71

Harnett County-- In the Sand Hill Region, Harnett's land is rolling with fertile sandy soil. The best gravel deposits of any county in the State occur here. Brick clays are also found. The merchantable timber is longleaf and loblolly pine. Waters include the Upper Little, Lower Little, Black, and Cape Fear Rivers, swamps, and numerous creeks. A hydroelectric plant is located at Buckhorn Falls on the Cape Fear River.

The chief cash crops are tobacco, cotton, and corn. Other crops include Irish and sweet potatoes, small grains, soybeans, and hay. The western area of the county is suitable for peach growing. Dairy products are important. Textiles comprise the largest single industry, with two plants at Erwin. There are many sawmills in the county. A planing and plywood mill is located at Kipling. Other industries include a brick works, a marble and granite works, a cotton oil and fertilizer mill, and mattress and agricultural-machinery manufactures. The second largest wagon-cotton market in the State is located at Dunn.

Communities include Lillington (county seat), Dunn, Erwin, Kipling, Coats, Barclaysville, Angier, Duncan, Bunnlevel, Buies Creek, Mamers, Olivia, Pineview, Johnsonville and Spout Springs.

Rainfall (inches)	47.34
Snowfall (inches)	8.2
Mean annual temperature	60.2
Growing season (days)	192
Tobacco (1952 Val.)	$12,600,000
Corn (1952 Val.)	$ 3,456,000
Cotton (1952 Val.)	$ 2,025,000
Total Land Area (acres)	387,480
Forest Area (acres)	232,200
Total Tax Value	$51,659,564
Tax Rate	$1.34

Hoke County-- A Sandhills county, Hoke is low and rolling. Most of the northern portion of the county is occupied by the Fort Bragg Military Reservation, largest in the United States. Merchantable species of trees found in the county are longleaf and loblolly pine, and a small amount of gum and oak. Waters of the Cape Fear River Basin in the northern and greater part of the county include Lower Little River, Rockfish Creek, Little Rockfish Creek, and numerous smaller creeks. The southern and lesser part of the county lies in a part of the Lumber River Valley (Yadkin-Pee Dee River Basin).

The chief cash crops are tobacco, cotton, corn, and small grains. The county ships large quantities of watermelons. Other crops include cantaloupes, peaches, hay, and truck crops. Livestock, dairy products, and poultry are

important. Raeford, county seat, where industrial activity is concentrated, has a cotton mill, an oil-fertilizer company, a concrete works, lumber operators, two textile mills, and a poultry-dressing plant.

Communities, in addition to Raeford, include Montrose, Timberland, Bowmore, Antioch, Dundarrach, Rockfish, and Lobelia.

Rainfall (inches)	44.57
Snowfall (inches)	5.0
Mean annual temperature	62.2
Growing season (days)	230
Tobacco (1952 Val.)	$2,500,000
Cotton (1952 Val.)	$3,500,000
Corn (1952 Val.)	$1,250,000
Total Land Area (acres)	264,960
Forest Area (acres)	178,900
Total Tax Val.	$13,984,195
Tax Rate	$1.10

Lee County-- In the eastern Piedmont section, Lee County has a rolling topography in the north with sandhills in the south. The western half contains shales and clays suitable for brick and tiles. Large deposits of bituminous coal are now being mined again. A red sandstone, and also material used in road construction and building, occur near Sanford, county seat. Principal merchantable species of trees are loblolly, longleaf and shortleaf pine, and oak. Waters include the Deep, Upper Little, and Cape Fear Rivers, and Pocket, Lick, Governors, Patterson, and other creeks.

Tobacco is the leading cash crop. Corn, hay, cotton, small grains, and vegetables are also important. Peaches and dewberries abound. The largest factory is a precision-machine shop at Sanford, which also manufactures railway cars. There are large textile mills in the county, and lumbering, furniture, and stone products are important. Pottery is also made in one of the largest potteries in the State.

Communities, in addition to Sanford, include Lemon Springs, Swann, White Hill, Tramway, Broadway, Colon, Cumnock, Osgood, and Rosser.

Rainfall (inches)	44.35
Snowfall (inches)	6.6
Mean annual temperature	59.9
Growing season (days)	191
Tobacco (1951 Val.)	$4,511,530
Cotton (1951 Val.)	$276,570
Corn (1951 Val.)	$407,790
Total Land Area (acres)	163,200
Forest Area (acres)	84,000
Total Tax Val.	$25,588,517
Tax Rate	$1.45

Moore County--In the central Piedmont, and hilly in the north with sandhills in the south, Moore County is the site of the famous winter-golf resorts, Pinehurst and Southern Pines. The rolling area of sand, shaded by longleaf pine, is believed to have been at one time a great inland sea. Brick

and tile clays occur in the northeastern part of the county, and sand and gravel in the southern part. The county is one of the world's leading producers of pyrophyllite (talc), which occurs in a series of lenses from Glendon to Hemp. Chief merchantable species of trees are shortleaf, loblolly, and longleaf pine, and oak. Waters in the Cape Fear River Basin include the Deep and Lower Little Rivers, and Bear, Cabin, McLendons, Big Governors, Crains, and other creeks.

Tobacco is the chief cash crop. The Sand Hills Region is one of the finest fruit-growing belts in the United States, and, in addition to peaches, the county is a leading dewberry and melon producer. Corn, cotton, wheat, oats, and hay are leading crops. Besides the remunerative tourist trade, Moore's principal industries are textiles and lumbering. Textile manufacturing, which includes cotton, rayon, silk, and knitting mills, is becoming increasingly important. Pine lumber is an important product with numerous small sawmills throughout the county. Much of the hardwood produced is used within the county for furniture manufacture. The talc products, pottery, and stone quarrying form large industries.

Communities include Carthage, (county seat), Southern Pines, Pinehurst, Aberdeen, Robbins, Vass, West End, Pine Bluff, Eagle Springs, Manly, Lakeview, and Niagara.

Rainfall (inches)	50.30
Snowfall (inches)	7.5
Mean annual temperature	61.3
Growing season (days)	213
Tobacco (1951 Val.)	$4,272,370
Corn (1951 Val.)	$ 523,680
Cotton (1951 Val.)	$ 387,180
Total Land Area (acres)	430,080
Forest Area (acres)	305,400
Total Tax Value	$40,496,723
Tax Rate	$1.35

New Hanover County-- A peninsula formed by the Cape Fear River and the Atlantic Ocean, New Hanover County is in the southern Coastal Region. The land is low and fertile. There is some mineral production, and marl pits occur near Castle Hayne, Fort Fisher, and along the northeast bank of the Cape Fear River. Principal merchantable species of trees are longleaf, loblolly, and pocosin pines, and some gum. Waters include the Cape Fear, Northeast Cape Fear, and Brunswick Rivers; Smith, Hewletts, and Island Creeks; Myrtle, Greenville, Wrightsville, Masonboro, Middle, and Prince George Sounds; Mason, Moore, Masonboro, and Corncake Inlets; Greenfield Lake, the Intracoastal Waterway, and the Atlantic Ocean.

Livestock products, particularly dairy and poultry, are among the leading income sources. Peanuts and food crops rank next in importance. Horticultural specialties are developed in this region. One of the several agricultural colonies, developed by Hugh McRae of Wilmington, is noted for the thousands of flowers which it harvests and markets every season. New Hanover ranks high on the eastern seaboard in petroleum distribution. Wilmington is the largest ocean port on the North Carolina Coast. An important shipbuilding center

during World Wars I and II, the peacetime economy of the city as well as the county is based on tourist trade, shipping, and its importance as a retail and distributing center. Other industries include lumbering, manufacture of food products, textiles, apparel, wood products, chemical and stone products, and some commercial fishing.

Communities include Wilmington, county seat, Carolina Beach, Wrightsville Beach, Castle Hayne, Audubon, Wrightsville Sound, Sea Gate, Harbor Island, Garden City, Winter Park Gardens, and Winter Park.

Rainfall (inches)	49.16
Snowfall (inches)	1.5
Mean annual temperature	63.4
Growing season (days)	237
Tobacco (1951 Val.)	$165,390
Corn (1951 Val.)	$ 81,930
Peanuts (1951 Val.)	$ 38,920
Total Land Area (acres)	124,160
Forest Area (acres)	101,500
Total Tax Val. (1952)	$103,705,828
Tax Rate (1952)	$1.10

Orange County-- In the Piedmont section, Orange County has a rolling topography, with fertile soil and moderate climate. Clays, suitable for brickmaking and granite, occur in the vicinity of Hillsboro. The stone used for building Duke University came from a quarry near Hillsboro. Chief merchantable species of trees are shortleaf and loblolly pines, oak, poplar, hickory, and red cedar. Waters in the Cape Fear River Basin include the Haw River, University Lake, and Cane, Collins, Morgan, Bolin, and New Hope Creeks. Waters in the Neuse River Basin include Eno River, North and South Forks of Little River, and McGowan, Seven Mile, Strouds, and Stony Creeks.

The University of North Carolina is situated at Chapel Hill. Its College of Liberal Arts includes the schools of Commerce, Law, Library Science, Medicine, Pharmacy, Public Health, the College of Arts and Sciences, Graduate School, Summer School, School of Fine Arts, and the Extension Division. While the University is coeducational, women are not allowed to enter before their junior year.

Tobacco is the leading crop in Orange County. Dairying and production of poultry bring in the second largest farm income. Other crops include corn, hay, wheat, and cotton. An outcropping of hilly country near Hillsboro, county seat, renders the region adaptable for fruit and livestock farming. Textiles, lumbering, and furniture manufacturing are the principal industries, centered chiefly at Hillsboro and Carrboro. Manufactures at Hillsboro include cedar chests, oil, flour, timber, cotton, and rayon. Textile plants and lumber mills are located at Carrboro.

Communities, in addition to those indicated above, include Mebane, Efland, and Cedar Grove.

Rainfall (inches)	47.19
Snowfall (inches)	9.2

Mean annual temperature	59.8
Growing season (days)	210
Tobacco	$2,500,000
Dairy and Poultry Products	$2,500,000
Corn	$ 150,000
Total Land Area (acres)	254,720
Forest Area (acres)	149,400
Total Tax Val. (1952)	$37,931,453
Tax Rate (1952)	$1.00

Pender County-- A large county in the south coastal region, Pender has a low fertile terrain with large swamps and piney sandhills. The county is bordered on the east by a narrow strip of outer banks formed by the Atlantic Ocean, the Intracoastal Waterway, and several inlets. Principal merchantable species of trees are gum, pine, cypress, and oak. Waters include the Cape Fear, Northeast Cape Fear, and Black Rivers; Colvins, Moore, Long, Horse, Rileys, Turkey, Holly, Merricks, Shelter, Shaken, and Harrison Creeks; Topsail Sound, the Intracoastal Waterway, and the Atlantic Ocean.

Tobacco is the leading cash crop, with corn, livestock, vegetables, fruit, and poultry also important. Dairying is increasing, as well as the raising of wheat and oats. At the North Carolina Coastal Plains Agriculture Experiment Station at Willard in the northeastern part of the county near the Pender-Duplin County Line, experiments are conducted with grapes, strawberries, blueberries, poultry, and other agricultural products. Cucumbers and green beans are grown in large quantities. Penderlea Farms, near the Coastal Plains Experiment Station, was a Federal project containing 192 farms of about 20 acres each. Under changing economical conditions, the farms have been combined into larger units, and dairying and bulb-raising have given the project promise of success. Lumbering is the leading industry. There is a small textile-knitting mill in the county, and several new agricultural industries, which have sprung up recently, include the freezing and packaging of turkeys, blueberries, and other farm products.

Communities include Burgaw, county seat, Rocky Point, Hampstead, Atkinson, Maple Hill, Topsail, Watha, Currie and Willard.

Rainfall (inches)	48.70
Snowfall (inches)	2.8
Mean annual temperature	62.4
Growing season (days)	204
Tobacco (1951 Val.)	$3,359,770
Corn (1951 Val.)	$ 921,250
Peanuts (1951 Val.)	$ 202,400
Total Land Area (acres)	548,480
Forest Area (acres)	401,000
Total Tax Val.	$14,450,000
Tax Rate	$1.50

Randolph County-- Located in the central Piedmont section, Randolph County has a high and hilly topography, with the Uwharrie Range's high, gently-rolling ridges, and with thrifty farms and fertile fields, traversing the western section. Gold, silver, and some copper are distributed over the county,

and in the past some of the most productive gold mines in the State were operated here. Pyrophyllite, used in the manufacture of glass, enamel, porcelain, tile, etc., is mined near Staley. Brick and tile clays are found along the stream flats. Chief merchantable species of trees are shortleaf pine, oak, poplar, and spruce pine. Waters in the Cape Fear River Basin include Deep River and Fork, Brush, Richland, Sandy, Polecat, and Muddy Creeks. Waters in the Yadkin-Pee Dee River Basin include Uwharrie, Little Uwharrie, and Little Rivers, and Toms, Carraway, and Jackson Creeks.

Chief crops are tobacco, corn, small grains, and hay, with good diversification in field-truck crops, fruit trees, and bees. It is a good dairying and livestock county, and the county derives a large part of its farm income from dairy products. A textile and furniture center, Randolph County also has several hosiery mills, and produces cotton, nylon, silk and wool products, lumber products, apparel, and furniture. Cotton mills are located along the Deep River at Worthville, Cedar Falls, Franklinville, Ramseur, and Coleridge. Most of the other industries are located at Randleman, Liberty, and Asheboro, county seat.

Communities, in addition to those indicated above, include Trinity, the former site of Trinity College (now Duke University at Durham), Seagrove, Julian, Sophia, and Archdale.

Rainfall (inches)	45.29
Snowfall (inches)	10.7
Mean annual temperature	61.0
Tobacco (1952 Val.)	$2,564,254
Dairy Products (1952 Val.)	$2,775,000
Poultry and Eggs (1952 Val.)	$1,794,000
Total Land Area (acres)	512,640
Forest Area (acres)	291,700
Total Tax Val. (1952)	$72,262,765
Tax Rate	$0.98

Rockingham County-- In the northern Piedmont section, the topography of Rockingham is rolling. Running through part of the county is a strip of Triassic shales and clays which are utilized by a brick and pipe company at Madison. A seam of coal and carbonaceous shales occurs in this same belt. Granite is found near Stacey. Principal merchantable species of trees are shortleaf and spruce pine, oak, poplar, and hickory. Waters in the Cape Fear River Basin include Haw River, and Little and Troublesome Creeks. Waters in the Roanoke River Basin include the Dan, Mayo, and Smith Rivers, and Wolf Island, Hogans, Matrimony, Buffalo, Rockhouse, Jacobs, and Island Creeks.

Tobacco, corn, and vegetables are the leading crops. Other crops raised include hay, Irish and sweet potatoes, and small grains. Textiles comprise the leading industry, and numerous mills produce a diversified selection of textile products from cotton, wool, silk, and rayon. The large mills of the Marshall Field Company (recently sold to Fieldcrest Mills) are located in Leaksville, Spray, and Draper, and there are other textile plants at Reidsville and Mayodan. Men's and boys' apparel are made at the Washington Mills at Mayodan. Reidsville, the largest town and industrial center of the county, is the site of the American Tobacco Company plant which manufactures Lucky Strike cigarettes. Other industries include lumbering, furniture manufacturing, printing and publishing, food, and chemicals.

Communities, in addition to those indicated above, include Wentworth, county seat, Stoneville, and Ruffin.

Rainfall (inches)	43.86
Snowfall (inches)	11.4
Mean annual temperature	59.7
Growing season (days)	203
Tobacco	$9,296,000
Corn	$ 729,000
Hay	$ 182,250
Total Land Area (acres)	366,080
Forest Area (acres)	168,400
Total Tax Val.	$129,800,000
Tax Rate	$0.75

Sampson County-- Located in the southwest coastal section, Sampson is one of the largest counties in the State. Sand and gravel, suitable for road building, are found in the southwest part of the county near Garland. Two brick companies, which utilize clays found in the vicinity, are located at Roseboro. Marl deposits extend from the headwaters of Six Run Creek to the south and west. Sampson County, consisting of a large amount of woodland, is among the large producers of timber. Chief merchantable species of trees are loblolly and longleaf pine, and gum. Waters include the Black and South River, Mingo Swamp, and Little Coharie, Great Coharie, and Six Run Creeks.

Tobacco, cotton, and corn are the leading crops. A recently-opened tobacco market at Clinton, county seat, does a thriving trade, and the fruit and vegetable market here is one of the large produce-auction markets in the United States. Green peppers, huckleberries, and livestock are also important. The principal industrial activity in the county is lumbering, with about 20 sawmills. Some timber is also cut for veneer logs. There is a textile plant at Roseboro and an electrical-products plant at Clinton. Three furniture plants are located at Clinton. Other industries include food products, printing, and publishing.

Pineland College for girls and Edwards Military Institute are located at Salemburg. Communities, in addition to those indicated above include Newton Grove, Ingold, and Ivanhoe.

Rainfall (inches)	47.15
Snowfall (inches)	5.1
Mean annual temperature	61.7
Growing season (days)	222
Tobacco (1951 Val.)	$13,000,000
Corn (1951 Val.)	$ 5,100,000
Cotton (1951 Val.)	$ 3,253,995
Total Land Area (acres)	616,320
Forest Area (acres)	338,700
Total Tax Val.	$39,250,000
Tax Rate	$1.40

Watershed Boundary-- The boundary line of the Cape Fear River Watershed, in a clockwise direction, extends generally as follows:

Beginning at Long Beach in Brunswick County about 5.5 miles west of Southport.

Thence in a northeasterly direction about 4 miles to a point on N. C. Highway 130 about one mile southeast of the Town of Smiths;

Thence in a northeasterly direction about 3 miles to the divide between River Swamp Creek and Allen Creek;

Thence north along the divide between Middle Swamp Creek and Mills Creek, along the divide between Pinch Gut Creek and Bell Swamp Creek, and through the eastern part of Green Swamp to a point on the Columbus-Brunswick County Line about 9 miles southeast of Bolton in Columbus County.

Thence northwest about 8 miles and northeast about 2 miles to Bolton;

Thence northeast about 5 miles to a point on the Seaboard Air Line Railway about 1½ miles northwest of East Arcadia in Bladen County;

Thence northwest along this railway to a point about 2 miles southeast of Council;

Thence generally parallel to, and about 3 miles west of, N. C. Highway 87 to a point on an unnumbered highway about 2 miles east of Lisbon;

Thence west on this highway through Lisbon and Bluefield to its intersection with another unnumbered highway about 3 miles north of Clarkton;

Thence northwest about 4 miles and north about 4 miles to a point on the Virginia & Carolina Southern Railway about 3½ miles west of Elizabethtown;

Thence generally parallel to, and from 0.5 to 2 miles west of, the Cape Fear River to a point on N. C. Highway 87 about 3 miles southeast of Tarheel;

Thence along N. C. Highway 87 through Tarheel to Duart;

Thence west on N. C. Highway 20 to Tobermory;

Thence in Bladen and Cumberland Counties, approximately parallel to the Robeson-Bladen County Line and the Robeson-Cumberland County Line and from 0.5 to 2 miles east of those lines, to Roslin in Cumberland County;

Thence in Cumberland County along an unnumbered highway to a point on the Robeson-Cumberland County Line about 2½ miles north of Parkton in Robeson County.

Thence northwest along the Robeson-Cumberland County Line and southwest along the Hoke-Robeson County Line to the intersection of the latter line with an unnumbered highway between Raeford and Parkton;

Thence along that highway in Hoke County to Raeford;

Thence along N. C. Highway 211 in Hoke County through Timberland, Montrose, and McCain to Ashley Heights;

Thence north about 5 miles, and northwest about 2 miles, to Southern Pines in Moore County;

Thence northwest about 2 miles, and southwest about 1.5 miles, to Pinehurst;

Thence along the Norfolk Southern Railroad, through West End, Elberta, Eagle Springs, and Samarcand in Moore County; Candor, Biscoe, Star, Ether, Steeds, and Ashbury in Montgomery County; and Seagrove, Michfield, and Ulah in Randolph County, to Asheboro;

Thence along the H. P. R. A. and Southern Railroad to High Point in Guilford County;

Thence generally parallel to, and approximately 0.5 mile west of, the Davidson-Guilford and Forsyth-Guilford County Lines to a point on an unnumbered highway in Forsyth County about three miles west of Oak Ridge in Guilford County;

Thence northeast along that highway to its intersection with N. C. Highway 68 in Guilford County;

Thence north on N. C. Highway 68 to Stokesdale;

Thence northeast on N. C. Highway 65 through Bethany in Rockingham County to the junction of an unnumbered highway with N. C. Highway 65 about 2.5 miles northeast of Bethany;

Thence along that unnumbered highway to its junction with N. C. Highway 65 about 2.5 miles southeast of Wentworth;

Thence east on N. C. Highway 65 to Reidsville;

Thence southeast on N. C. Highway 87 to Thompsonville;

Thence east about 5.5 miles from Thompsonville in Rockingham County to Camp Springs in Caswell County;

Thence east and southeast, on an unnumbered highway and on N. C. Highway 62, to Anderson;

Thence east on an unnumbered highway to Baynes;

Thence southeast about five miles to a point on the Alamance-Orange County line about 2.5 miles southwest of Carr in Orange County;

Thence northeast on N. C. Highway 49 through Carr to the junction of a county road about 1.5 miles northeast of Carr;

Thence south in Orange County, along the divide between Eno River and its headwaters and the headwaters of Haw River, about 12.5 miles to Buckhorn;

Thence east in Orange County along the divide between tributaries of the Eno River and tributaries of the Haw River to a point on the Southern Railway about one mile east of University Station;

Thence east and southeast along the Southern Railway to the City of Durham;

Thence south along the Southern Railway through Bilboa, Brassfield, and Nelson to a point in Wake County about 1.5 miles south of the Durham-Wake County Line;

Thence west along a county road and an unnumbered highway to Carpenter;

Thence along the Durham and Southern Railway through Upchurch, Apex, Holly Springs, Wilbon, Fuquay Springs, Holland, and Kennebec to a point on the Harnett-Wake County Line about 0.5 mile south of Kennebec;

Thence along the Harnett-Wake and Harnett-Johnston County Lines to a point on the Harnett-Johnston County Line about 2.5 miles south of Hardy in Johnston County;

Thence about three miles east to N. C. Highway 50;

Thence south and southeast on N. C. Highway 50 through Benson to a county road about 2.5 miles southeast of Benson;

Thence south and southwest along that road and an unnumbered highway through the Village of Woods in Johnston County to the Johnston-Sampson County Line;

Thence successively along the Johnston-Sampson and Wayne-Sampson Lines to Dobbersville in Wayne County;

Thence in Wayne County generally along N. C. Highway 55 through Mt. Olive to Seven Springs;

Thence successively along the Wayne-Lenoir, Duplin-Lenoir, Duplin-Jones, and Duplin-Onslow County Lines to the intersection of the Duplin-Onslow County Line and N. C. Highway 24;

Thence along the divides between Black Swamp and New River, Nine Mile Creek and Southwest Creek, and Sandy Run Swamp and Southwest Creek to a point on the Atlantic Coast Line Railroad about 1.5 miles southwest of Verona in Onslow County;

Thence along the Atlantic Coast Line Railroad through Dixon and Folkstone to Hollyridge;

Thence between Hollyridge in Onslow County and Edgecombe in Pender County in a loop around the source of Beasleys Creek;

Thence along the Atlantic Coast Line Railroad through Annandale, Hampstead, and Scotts Hill in Pender County to the northeast corner of the City of

Wilmington.

Thence south about 7.5 miles through Winter Park to U. S. Highway 421; and

Thence along U. S. Highway 421 through Carolina Beach, Wilmington Beach and Kure Beach to Fort Fisher.

Cape Fear River Basin Streams - There follows a list, alphabetically arranged, of streams in the Cape Fear River Basin, the names of which are shown on available maps. There are a great number of streams shown on such maps, the names of which are not indicated. There are shown on the following list the stream into which each of the streams, alphabetically placed on the list, flows, and also the county in which the junction of the corresponding two streams is located. It is believed that this list will be helpful to interested persons in quickly locating on a county, topographical, or other map any stream included in the list, and also to trace the course of the stream throughout the basin.

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Allen Creek	Lilliput Creek	Brunswick
Anderson Creek	Lower Little River	Harnett
Angola Creek	Holly Shelter Creek	Pender
Avents Creek	Cape Fear River	Harnett
Bachelor Creek	Richland Creek	Randolph
Back Creek	Great Alamance Creek	Alamance
Back Marsh	N. E. Cape Fear River	Duplin
Back Swamp	Cypress Creek	Duplin
Banes Creek	Little Rockfish Creek	Cumberland
Barbecue Swamp	Upper Little River	Harnett
Barnards Creek	Cape Fear River	New Hanover
Bear Creek	Cane Creek	Orange
Bear Creek	Deep River	Moore
Bear Creek	Rocky River	Chatham
Bear Swamp	Goshen Swamp	Duplin
Bearskin Swamp	Little Coharie Creek	Sampson
Beaver Creek	Great Alamance Creek	Alamance
Beaver Creek	Little Rockfish Creek	Cumberland
Beaver Creek	New Hope River	Chatham
Beaver Creek	Reedy Fork Creek	Guilford
Beaver Creek	Rockfish Creek	Hoke
Beaverdam Creek	Great Coharie Creek	Sampson
Beaverdam Creek	South River	Cumberland-Sampson
Beaverdam Swamp	Six Runs Creek	Sampson
Beaverdam Swamp	Mingo Swamp	Cumberland-Sampson
Beaverdam Swamp Canal	Lower Little River	Harnett
Bell Swamp Creek	Rices Creek	Brunswick
Benaja Creek	Haw River	Rockingham
Benton Branch	Stony Creek	Caswell
Big Alamance Creek	Great Alamance Creek	Guilford
Big Branch	Barbecue Swamp	Harnett
Big Branch	Beaver Creek	Cumberland
Big Buffalo Creek	Deep River	Lee-Chatham
Big Governors Creek	Deep River	Moore
Big Juniper Creek	McLendons Creek	Moore
Big Swamp	South River	Cumberland-Sampson

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Birch Creek	Roscoe Creek	Pender
Black Branch	Beaver Creek	Hoke
Black Creek	Puppy Creek	Hoke
Black River	Cape Fear River	Pender
Bloodrun Creek	Brush Creek	Chatham
Blounts Creek	Little Cross Creek	Cumberland
Bob Branch	Muddy Creek	Cumberland
Bolin Creek	Little Creek	Durham
Boyds Creek	Haw River	Alamance
Browns Creek	Cape Fear River	Bladen
Browns Swamp Creek	South River	Cumberland
Brunswick River	Cape Fear River	Brunswick
Brush Creek	Deep River	Randolph
Brush Creek	Reedy Fork Creek	Guilford
Buck Branch	Burden Creek	Durham
Buckhead Creek	Little Rockfish Creek	Cumberland
Buckhorn Creek	Cape Fear River	Chatham
Buckle Creek	Lyon Creek	Pender
Buck Marsh	N.E. Cape Fear River	Wayne
Buffalo Creek	Deep River	Moore
Buffalo Creek	Lower Little River	Hoke
Buffalo Creek	Reedy Fork Creek	Guilford
Buies Creek	Cape Fear River	Harnett
Bull Run Creek	Deep River	Guilford
Burden Creek	Northeast Creek	Durham
Burgaw Creek	N.E. Cape Fear River	Pender
Bush Creek	Cape Fear River	Lee-Chatham
Bush Creek	Deep River	Randolph
Bush Creek	New Hope River	Chatham
Buttermilk Creek	Jordans Creek	Alamance
Cabin Branch	Rockfish Creek	Hoke
Cabin Creek	Bear Creek	Moore
Calf Branch	Rockfish Creek	Hoke
Camels Creek	Cape Fear River	Harnett
Cane Creek	Haw River	Orange
Cane Creek	Haw River	Alamance
Carrs Creek	Upper Little River	Lee
Carver Creek	Cape Fear River	Bladen
Carvers Creek	Cape Fear River	Cumberland
Catskin Creek	Merricks Creek	Pender
Cedar Creek	Cape Fear River	Harnett
Chocolate Creek	Stinking Quarter Creek	Guilford
Clear Run Swamp	Black River	Sampson
Collins Creek	Haw River	Chatham
Colly Creek	Black River	Pender
Colvins Creek	Black River	Pender
Copper Mine Creek	Hughes Creek	Lee
Cotton Creek	Cabin Creek	Moore
Crains Creek	Lower Little River	Hoke
Crane Creek	Six Runs Creek	Sampson
Crawleys Creek	Big Governors Creek	Moore
Cub Creek	Morgan Creek	Chatham
Cypress Creek	Lower Little Creek	Harnett
Cypress Creek	N.E. Cape Fear River	Duplin
Daniels Creek	Cape Fear River	Harnett
Deep Creek	Jordans Creek	Alamance

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Deep Creek	Lower Little River	Hoke
Deep River	Cape Fear River	Chatham-Lee
Dews Creek	Town Creek	Brunswick
Doctors Creek	Rock Fish Creek	Duplin-Pender
Dry Creek	Cabin Creek	Moore
Dry Creek	Cape Fear River	Harnett
Dry Creek	Haw River	Chatham
Dry Fork	Pocket Creek	Lee
Duffs Creek	Rock Fish Creek	Duplin
Dunhams Creek	Crains Creek	Moore
Dutchman Creek	Elizabeth River	Brunswick
East Buies Creek	Buies Creek	Harnett
East Mingo Creek	Mingo Swamp	Johnston-Harnett
East Prong	Deep River	Guilford
Elder Branch	Maxwell Creek	Duplin
Elizabeth River	Cape Fear River	Brunswick
Ellis Creek	Cape Fear River	Bladen
Fall Creek	Cape Fear River	Lee-Chatham
Falls Creek	Deep River	Moore
Ferrells Creek	Haw River	Chatham
Flat Creek	Lower Little River	Hoke
Fish Creek	Cape Fear River	Harnett
Fork Creek	Deep River	Randolph
Godfrey Creek	Harrison Creek	Pender
Goshen Swamp	N.E. Cape Fear River	Duplin
Grays Branch	Stony Creek	Caswell
Grays Creek	Cape Fear River	Cumberland
Great Alamance Creek	Haw River	Alamance
Great Coharie Creek	Coharie River	Sampson
Grove Creek	N.E. Cape Fear River	Duplin
Gum Branch	Rockfish Creek	Hoke
Gum Creek	Great Alamance Creek	Alamance
Gum Fork Creek	Hughes Creek	Lee
Gum Log Canal	Cape Fear River	Cumberland
Hammond Creek	Cape Fear River	Bladen
Harrisons Creek	Cape Fear River	Bladen
Harrison Creek	Merricks Creek	Pender
Haw Creek	Haw River	Alamance
Haw Mill Creek	Black River	Pender
Haw River	Cape Fear River	Chatham-Lee
Hector Creek	Cape Fear River	Harnett
Hector Creek	Lower Little River	Harnett-Cumberland
Herds Creek	Crains Creek	Moore
Hickory Creek	Registers Creek	Guilford
Hoe Swamp	Six Runs Creek	Sampson
Hollands Creek	Rocky River	Chatham
Holly Shelter Creek	N.E. Cape Fear River	Pender
Hood Creek	Cape Fear River	Brunswick
Horse Branch	Long Creek	Pender
Horse Creek	Dry Creek	Moore
Horsepen Creek	Reedy Fork Creek	Guilford
Hughes Creek	Lick Creek	Lee
Indian Creek	Cape Fear River	Brunswick
Indian Creek	Deep River	Chatham
Island Creek	N.E. Cape Fear River	Duplin

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Island Creek	N.E.Cape Fear River	New Hanover-Pender
Jackeys Creek	Brunswick River	Brunswick
James Creek	Lower Little River	Hoke
Jim Branch	Buckhorn Creek	Wake
Joes Fork	Nicks Creek	Moore
Johns Swamp	Colly Creek	Bladen
Jones Swamp	South River	Cumberland-Sampson
Jordan Creek	Haw River	Alamance
Jumping Run	Lower Little River	Hoke
Juniper Creek	Cape Fear River	Harnett
Juniper Creek	Rockfish Creek	Hoke
Juniper Creek	Upper Little River	Lee
Juniper Swamp	Shaken Creek	Pender
Kellys Creek	Riley Creek	Pender
Killets Creek	McLendons Creek	Moore
Kill Swamp	Great Coharie Creek	Sampson
Kit Creek	Northeast Creek	Chatham
Lacys Creek	Rocky River	Chatham
Lake Creek	Colly Creek	Bladen
Lake Run	Thoroughfare	Pender
Landrum Creek	Rocky River	Chatham
Lewis Creek	N. E. Cape Fear River	Pender
Lewis Swamp	Town Creek	Brunswick
Lick Creek	Cape Fear River	Lee-Chatham
Lillington Creek	N.E. Cape Fear River	Bladen
Lilliput Creek	South River	Bladen-Sampson
Limestone Creek	N.E. Cape Fear River	Duplin
Little Alamance Creek	Great Alamance Creek	Guilford
Little Beaver Creek	Beaver Creek	Chatham
Little Beaverdam Swamp	South River	Cumberland-Sampson
Little Brush Creek	Brush Creek	Randolph
Little Buffalo Creek	Deep River	Lee-Chatham
Little Coharie Creek	Coharie Creek	Sampson
Little Colly Creek	Colly Creek	Bladen
Little Creek	Crains Creek	Hoke
Little Creek	McLendons Creek	Moore
Little Creek	New Hope Creek	Orange
Little Creek	New Hope River	Durham
Little Creek	S. Prong, Stinking Creek	Alamance
Little Cross Creek	Cape Fear River	Cumberland
Little Governors Creek	Big Governors Creek	Lee-Moore
Little Indian Creek	Indian Creek	Chatham
Little Juniper Creek	Upper Little River	Lee
Little Lick Creek	Lick Creek	Lee
Little Pocket Creek	Pocket Creek	Lee
Little Polecat Creek	Polecat Creek	Randolph
Little Rockfish Creek	Cape Fear River	Cumberland
Little Sandy Run Swamp	Sandy Run	Onslow
Little Shaddox Creek	Cape Fear River	Lee-Chatham
Little Troublesome Creek	Haw River	Rockingham
Little Whiteoak Creek	Whiteoak Creek	Wake
Long Creek	N.E. Cape Fear River	Bladen
Lonnie Wombles Creek	Cape Fear River	Lee-Chatham
Loves Creek	Rocky River	Chatham
Lower Little River	Cape Fear River	Harnett-Cumberland

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Lyon Creek	Cape Fear River	Pender
Lyon Swamp Canal	Lyon Creek	Bladen-Pender
Mallory Creek	Cape Fear River	Brunswick
Maple Run	Goshen Swamp	Duplin
Mare Branch	Juniper Creek	Lee
Marsh Swamp	Great Coharie Creek	Sampson
Marys Creek	Haw River	Alamance
Matthews Creek	N.E. Cape Fear River	Duplin
Maxwell Creek	N.E. Cape Fear River	Duplin
McDeeds Creek	Mill Creek	Moore
McDuffie Creek	Puppy Creek	Hoke
McIntosh Creek	Big Governors Creek	Moore
McLeans Branch	Lower Little River	Moore
McLeans Creek	Upper Little River	Harnett
McLendons Creek	Deep River	Moore
McLeod Creek	Lower Little River	Cumberland
McPhail Branch	Merkle Swamp	Sampson
Meadow Branch	Ferrell Creek	Chatham
Meadow Creek	Buffalo Creek	Moore
Meadow Creek	Haw River	Alamance
Meadow Creek	Deep River	Randolph
Meadow Creek	Rocky River	Chatham
Mears Fork	Haw River	Rockingham
Merkle Swamp	Great Coharie Creek	Sampson
Merricks Creek	N.E. Cape Fear River	Pender
Mill Creek	Brunswick River	Brunswick
Mill Creek	Cabin Creek	Moore
Mill Creek	Deep River	Randolph
Mill Creek	Doctors Creek	Duplin-Pender
Mill Creek	James Creek	Hoke
Mill Creek	Lower Little River	Moore
Mill Creek	Rileys Creek	Pender
Mill Creek	Rockfish Creek	Hoke
Mill Swamp	Six Runs Swamp	Sampson
Millers Creek	Stewarts Creek	Duplin
Mills Creek	Rices Creek	Brunswick
Mingo Swamp	South River	Cumberland-Sampson
Moores Creek	Shelter Creek	Pender
Moores Creek	Black Creek	Pender
Moores Creek	Reedy Fork Creek	Guilford
Morgan Creek	Cub Creek	Chatham
Morgans Creek	Long Creek	Pender
Motes Creek	Haw River	Alamance
Mount Pleasant Creek	Sandy Creek	Randolph
Mud Creek	New Hope Creek	Durham
Muddy Creek	Deep River	Randolph
Muddy Creek	N.E. Cape Fear River	Duplin
Mulatto Branch	Upper Little River	Lee
Nahunga Creek	Goshen Swamp	Duplin
Neals Creek	Cape Fear River	Harnett
Ness Creek	N.E. Cape Fear River	New Hanover
New Hope Creek	New Hope River	Durham
New Hope River	Haw River	Chatham
Nicholsons Creek	Rockfish Creek	Hoke
Nicks Creek	Lower Little River	Moore

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Nine Mile Swamp	Back Swamp	Duplin
N. Branch Rocky River	Rocky River	Randolph
North Buffalo Creek	Buffalo Creek	Guilford
Northeast Cape Fear River	Cape Fear River	Brunswick-New Hanover
Northeast Creek	New Hope River	Chatham
North Prong	Stinking Quarter Creek	Alamance
North Stinking Quarter Cr.	Beaver Creek	Guilford-Alamance
Obies Creek	Morgan Creek	Orange
Old Field Branch	Rockfish Creek	Hoke
Old Field Creek	New Hope Creek	Orange
Orton Creek	Cape Fear River	Brunswick
Owens Creek	Jordans Creek	Alamance
Padgett Swamp	Sandy Run	Onslow
Panther Creek	Northeast Creek	Chatham
Panther Creek	N.E. Cape Fear River	Duplin
Pappaw Creek	S. Prong Stinking Quarter Creek	Alamance
Parker Creek	New Hope River	Chatham
Parkers Creek	Cape Fear River	Harnett
Patchet Creek	Upper Little River	Lee
Patterson Branch	Puppy Creek	Hoke
Patterson Creek	Deep River	Lee-Chatham
Persimmon Branch	N.E. Cape Fear River	Duplin
Phillips Creek	Cape Fear River	Bladen
Phils Creek	Morgan Creek	Orange
Pike Creek	N.E. Cape Fear River	Pender
Piney Bottom Creek	Rockfish Creek	Hoke
Pitts Creek	Bells Whiteoak Creek	Chatham
Pleasant Creek	Sandy Creek	Randolph
Pocket Creek	Deep River	Lee-Chatham
Pokesberry Creek	Haw River	Chatham
Polecat Creek	Deep River	Randolph
Price Creek	Morgan Creek	Orange
Prince George Creek	N.E. Cape Fear River	New Hanover
Puppy Creek	Rockfish Creek	Hoke
Quaker Creek	Stagg Creek	Alamance
Raccoon Creek	Pocket Creek	Lee
Rattlesnake Branch	Town Creek	Brunswick
Reed Creek	Deep River	Randolph
Reedy Branch	Cane Creek	Alamance
Reedy Branch	Goshen Swamp	Duplin
Reedy Fork Creek	Haw River	Alamance
Registers Creek	Deep River	Guilford
Rices Creek	Town Creek	Brunswick
Richland Creek	Deep River	Randolph
Richland Creek	McLendons Creek	Moore
Richland Creek	Reedy Fork Creek	Guilford
Rileys Creek	Long Creek	Pender
Roberts Creek	Hughes Creek	Lee
Roberson Creek	Haw River	Chatham
Rock Creek	Little Alamance Creek	Guilford
Rock Creek	Stinking Creek	Alamance
Rock Fish Creek	N.E. Cape Fear River	Duplin-Pender
Rockfish Creek	Cape Fear River	Cumberland
Rocky Branch	Deep River	Chatham
Rocky River	Deep River	Chatham

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Roscoe Creek	Rileys Creek	Pender
Rye Swamp	Little Coharie Creek	Sampson
Sandy Creek	Deep River	Randolph
Sandy Creek	New Hope Creek	Durham
Sandy Run Swamp	Shelter Creek	Pender
Sawyer Creek	Rock Fish Creek	Duplin-Pender
Sevenmile Swamp	Great Coharie Creek	Sampson
Sevenmile Swamp	Little Coharie Creek	Sampson
Shaddox Creek	Cape Fear River	Chatham
Shaken Creek	Holly Shelter Creek	Pender
Shelter Creek	Holly Shelter Creek	Pender
Shelter Swamp	Sandy Run Swamp	Pender
Sills Creek	Sawyer Creek	Pender
Sings Creek	Wet Creek	Moore
Six Runs Creek	Black River	Sampson
Smith Creek	Deep River	Lee-Chatham
Smiths Creek	N.E. Cape Fear River	New Hanover
South Fork	Cane Creek	Alamance
South River	Black River	Bladen-Sampson
South Buffalo Creek	Buffalo Creek	Guilford
South Prong	Stinking Quarter Creek	Alamance
Stagg Creek	Haw River	Alamance
Stewart Creek	Beaver Creek	Cumberland
Stewarts Creek	Lower Little River	Harnett
Stewarts Creek	Rockfish Creek	Cumberland-Hoke
Stewarts Creek	Six Runs Creek	Sampson
Stinking Creek	Haw River	Chatham
Stinking Quarter Creek	Great Alamance Creek	Alamance
Stocking Head Creek	Maxwell Creek	Duplin
Stony Creek	Jordans Creek	Alamance
Stony Creek	Lick Creek	Lee
Sturgeon Creek	Mill Creek	Brunswick
Sugar Creek	Pocket Creek	Lee
Taylors Creek	Duffs Creek	Duplin
Tenmile Swamp	Six Runs Creek	Sampson
Terrell Creek	Haw River	Chatham
Third Fork Creek	New Hope Creek	Durham
Thomas Creek	Little Whiteoak Creek	Wake
Thorntons Creek	Cape Fear River	Harnett
Thoroughfare	Connection, Cape Fear & Black Rivers	Pender
Thump Swamp	Colly Creek	Bladen
Tick Creek	Rocky River	Chatham
Todds Creek	Cape Fear River	New Hanover
Tom Jack Creek	Whiteoak Creek	Chatham
Toms Creek	Stony Creek	Alamance
Town Creek	Cape Fear River	Brunswick
Troublesome Creek	Haw River	Rockingham
Trumpeter Swamp	Merricks Creek	Pender
Tuckahoe Creek	James Creek	Hoke
Tuckahoe Creek	Moores Creek	Pender
Turkey Creek	Lower Little River	Hoke
Turkey Creek	N.E. Cape Fear River	Pender
Turkey Creek	Six Runs Creek	Sampson
Turnbull Creek	Cape Fear River	Bladen
Twomile Creek	Deep River	Guilford

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Upper Little River	Cape Fear River	Harnett
Vernals Creek	Haw River	Alamance
Walden Creek	Cape Fear River	Brunswick
Wallace Branch	Lick Creek	Lee
Wads Creek	Lower Little River	Moore
Ward Swamp	Great Coharie Creek	Sampson
Weaver	Beaver Creek	Chatham
Weldon Creek	Cape Fear River	Brunswick
Wells Creek	Cane Creek	Alamance
West Buies Creek	Buies Creek	Harnett
Wet Creek	Cabin Creek	Moore
Whiteoak Creek	New Hope River	Chatham
White Oak Creek	Moores Creek	Pender
Whites Creek	Hammond Creek	Bladen
Wilkinson Creek	Haw River	Chatham
Williams Old Mill Branch	Great Coharie Creek	Sampson
Wolf Creek	Bear Creek	Moore
Wolf Pit Creek	Rockfish Creek	Hoke
Youngs Swamp	Goshen Swamp	Sampson

CHAPTER II - - USE OF WATER FOR DOMESTIC AND MUNICIPAL PURPOSES

Descriptions and Chemical Character of Public Water Supplies - - "Progress Report No. 1, Public Surface-Water Supplies in North Carolina, U. S. Geological Survey, Raleigh, 1947",prepared in cooperation with the State Board of Health, contains the following information regarding public surface-water supplies in the Cape Fear River Basin. Ownership is municipal unless otherwise indicated.

Apex, Wake County

Population - - 1940: 977 (1950: 1,065)
Source - - Impounding reservoir on two small streams
Treatment - - Coagulation with alum, chlorine, rapid sand filtration, final adjustment of pH with lime.

Sample collected - -	May 10, 1945	Na + K - -	5.1
Color - -	6	Bicarbonate -	20
Silica - -	4.2	Sulfate - -	31
Iron - -	.02	Chloride - -	11
Manganese - -	-	Fluoride - -	.0
Calcium - -	19	Nitrate - -	.7
Magnesium	1.5	Dissolved solids -	95
		Total hardness - -	54

Asheboro, Randolph County

Population - - 1940: 6,981 (1950: 7,701)
Supplies also about 2,000 people in the North Asheboro-Central Falls Sanitary District.
Sources - - Lakes (Nos. 1, 2, and 3).
Treatment - Coagulation with alum and lime, chloramine at times, rapid sand filtration, chlorine, final adjustment of pH with lime.

Sample collected - -	February 11, 1946	Bicarbonate - -	15
Color - -	1	Sulfate - -	24
pH - -	9.2	Chloride - -	2.8
Silica - -	8.2	Fluoride - -	.0
Manganese - -	.0	Nitrate - -	.3
Calcium - -	13	Dissolved solids - -	64
Magnesium	1.2	Total hardness - -	37
Na + K - -	1.9		

Burlington, Alamance County

Population - - 1940: 12,198 (1950: 24,560)
Supplies also about 150 people outside of city limits.
Source - - Stony Creek impounded.
Treatment - - Chlorine

Sample collected - -	January 31, 1946	Bicarbonate - -	40
Color - -	3	Sulfate - -	25
pH - -	9.3	Chloride - -	3.1
Silica - -	12	Fluoride - -	.0
Iron - -	.09	Nitrate - -	.4
Manganese	.0	Dissolved solids - -	87
Calcium - -	17	Total hardness - -	53
Magnesium - -	2.6		
Na + K - -	4.8		

Chapel Hill, Orange County

Population - - 1940: 3,654 (1950: 9,177)
Supplies also about 2,000 people in Carrboro and about 5,000 people at University of North Carolina.
Water system owned by the University of North Carolina.
Sources - - Neville, Morgan, and Price Creeks impounded in University Lake.
Treatment - - Aeration, coagulation with alum, chlorine, activated carbon, rapid adjustment of pH with lime.
Sample collected - - June 24, 1946

Color - -	7	Bicarbonate - -	21
pH - -	7.3	Sulfate - -	22
Silica - -	7.3	Chloride - -	3.8
Iron - -	0.04	Fluoride - -	0.1
Manganese - -	0.10	Nitrate - -	0.5
Calcium - -	13	Dissolved solids - -	67
Magnesium - -	1.5	Total hardness - -	39
Na + K - -	3.4		

Dunn, Harnett County

Population - - 1940: 5,256 (1950: 6,316)
Supplies also about 400 people outside of city limits and about 3,500 people in Erwin and Erwin Cotton Mills.
Source - - Cape Fear River.
Treatment - - Coagulation with alum, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - March 13, 1946.

Color - -	3	Bicarbonate - -	34
Silica - -	12	Sulfate - -	16
Iron - -	.04	Chloride - -	6.5
Manganese - -	.0	Fluoride - -	.1
Calcium - -	11	Nitrate - -	.6
Magnesium - -	2.4	Dissolved solids - -	76
Na + K - -	7.9	Total hardness - -	37

Fayetteville, Cumberland County

Population - - 1940: 17,428 (1950: 34,715)
Supplies also about 5,000 people outside of city limits and about 1,000 people in Bonnie Doone.
Sources - - Bonnie Doone Lake, Kornbou Lake, and Glenville Lake.
Treatment - Coagulation with alum and lime, chlorine, ammonia, rapid sand filtration, final adjustment of pH with lime.
Sample collected - - January 29, 1946

Color - -	2	Bicarbonate - -	14
pH - -	7.6	Sulfate - -	17
Silica - -	3.1	Chloride - -	6.2
Iron - -	0.02	Fluoride - -	0.0
Manganese - -	0.0	Nitrate - -	1.3
Calcium - -	12	Dissolved solids - -	56
Magnesium - -	1.1	Total hardness - -	34
Na + K - -	2.1		

Fort Bragg, Cumberland County

Population - - 1940: about 30,000
Water system owned by the Federal Government.

Source - - Little River.
Treatment - - Coagulation with alum and lime, chlorine, rapid sand filtration, chlorine, ammonia, final adjustment of pH with lime.
Sample collected - - September 13, 1946.

Color - -	3	Bicarbonate - -	16
pH - -	8.5	Sulfate - -	19
Silica - -	5.6	Chloride - -	6.8
Iron - -	.04	Fluoride - -	.1
Manganese - -	.0	Nitrate - -	.1
Calcium - -	14	Dissolved solids - -	68
Magnesium - -	.6	Total hardness - -	37
Na + K - -	2.5		

Greensboro, Guilford County

Population - - 1940: 59,319 (1950: 74,389)
Source - - Reedy Fork
Treatment - - Coagulation, rapid sand filtration, chlorine, final adjustment of pH by addition of lime.
Sample collected - - May 11, 1944.

Color - -	2	Bicarbonate - -	33
Silica - -	10	Sulfate - -	17
Iron - -	0.03	Chloride - -	2.0
Manganese - -	-	Fluoride - -	0.0
Calcium - -	13	Nitrate - -	0.3
Magnesium - -	1.9	Dissolved solids - -	69
Na + K - -	3.5	Total hardness - -	40

High Point, Guilford County

Population - - 1940: 38,495 (1950: 39,973)
Supplies also about 1,250 people outside of city limits.
Source - - Deep River impounded.
Treatment - Coagulation with alum, rapid sand filtration, ammonia, chlorine, final adjustment of pH with lime.
Sample collected - - April 28, 1944.

Color - -	1	Bicarbonate -	24
Silica - -	10	Sulfate - -	19
Iron - -	.02	Chloride - -	2.9
Manganese - -	-	Fluoride - -	.0
Calcium - -	10	Nitrate - -	.4
Magnesium - -	1.9	Dissolved solids - -	65
Na + K - -	5.1	Total hardness - -	33

Mebane, Alamance and Orange Counties

Population - - 1940: 2,060 (1950: 2,068)
Supplies also about 500 people outside of city limits.
Source - Mill Creek.
Treatment - - Coagulation with alum, rapid sand filtration, chlorine.
Sample collected - - April 22, 1946

		Na + K - -	7.0
Color - -	3	Bicarbonate - -	31
pH - -	6.8	Sulfate - -	11
Silica - -	18	Chloride - -	3.8
Iron - -	.02	Fluoride - -	.2
Manganese - -	.0	Nitrate - -	.2
Calcium - -	6.5	Dissolved solids - -	68
Magnesium - -	2.8	Total hardness - -	28

Ramseur, Randolph County

Population - - 1940: 1,220 (1950: 1,134)
Supplies also about 150 people outside of city limits.
Source - - Sandy Creek
Treatment - - Coagulation with alum and lime, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - June 10, 1946

Color - -	2	Bicarbonate - -	38
pH - -	8.1	Sulfate - -	21
Silica - -	15	Chloride - -	4.5
Iron - -	.02	Fluoride - -	.1
Manganese - -	.0	Nitrate - -	.2
Calcium - -	14	Dissolved solids - -	86
Magnesium - -	2.5	Total hardness - -	45
Na + K - -	6.7		

Randleman, Randolph County

Population - - 1940: 2,032 (1950: 2,066)
Supplies also about 200 people outside of city limits.
Source - Polecat Creek
Treatment - Coagulation with alum, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - June 10, 1946

Color - -	3	Bicarbonate - -	53
pH - -	8.1	Sulfate - -	19
Silica - -	19	Chloride - -	3.6
Iron - -	.03	Fluoride - -	.1
Manganese - -	.0	Nitrate - -	.5
Calcium - -	18	Dissolved solids - -	98
Magnesium - -	3.0	Total hardness - -	57
Na + K - -	5.4		

Robbins, Moore County

Population - - 1940: 972 (1950: 1,158)
Supplies also about 50 people outside of city limits.
Source - - Bear Creek
Treatment - - Coagulation with alum, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - November 18, 1944

Color - -	1	Bicarbonate - -	13
Silica - -	9.4	Sulfate - -	20
Iron - -	.02	Chloride - -	6.2
Manganese - -	-	Fluoride - -	.1
Calcium - -	9.6	Nitrate - -	.0
Magnesium - -	1.2	Dissolved solids - -	62
Na + K - -	5.3	Total hardness - -	29

Sanford, Lee County

Population - - 1940: 4,960 (1950: 10,013)
Supplies also about 3,000 people in Jonesboro
Source - - Licks Creek
Treatment - Coagulation with alum, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - May 14, 1946.

Color - -	3	Bicarbonate - -	20
pH - -	6.8	Sulfate - -	17
Silica - -	9.8	Chloride - -	4.5
Iron - -	.04	Fluoride - -	.0
Manganese - -	.09	Nitrate - -	.5
Calcium - -	11	Dissolved solids - -	62
Magnesium - -	1.1	Total hardness - -	32
Na + K - -	4.1		

Siler City, Chatham County

Population - - 1940: 2,197 (1950: 2,501)
Supplies also about 1,000 people outside of city limits.
Source - - Rocky River impounded
Treatment - - Coagulation with alum, rapid sand filtration, chlorine, ammonia, final adjustment of pH with lime.
Sample collected - - June 12, 1946

Color - -	8	Bicarbonate - -	36
pH - -	7.2	Sulfate - -	14
Silica - -	11	Chloride - -	3.8
Iron - -	0.03	Fluoride - -	0.2
Manganese - -	0.10	Nitrate - -	1.0
Calcium - -	12	Dissolved solids - -	70
Magnesium - -	2.1	Total hardness - -	39
Na + K - -	5.6		

Southern Pines, Moore County

Population - 1940: 3,225 (1950: 4,272)
Supplies also about 1,500 people outside of city limits.
Source - - Southern Pines Water Lake, McDeeds Creek impounded.
Treatment - Coagulation with alum and lime, chlorine, rapid sand filtration, activated carbon, calgon, chlorine, final adjustment of pH with lime.
Sample collected - - July 25, 1946.

Color - -	4	Bicarbonate - -	11
pH - -	7.9	Sulfate - -	7.7
Silica - -	1.2	Chloride - -	3.2
Iron - -	0.3	Fluoride - -	.1
Manganese - -	.0	Nitrate - -	.1
Calcium - -	7.0	Dissolved solids - -	30
Magnesium - -	.6	Total hardness - -	20
Na + K - -	.9		

Wilmington, New Hanover County

Population - - 1940: 33,407 (1950: 45,043)
Supplies also about 2,000 people outside of city limits.
Source - - Cape Fear River
Treatment - - Coagulation with alum, ammonia, chlorine, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected - - March 11, 1946

		Na + K - -	8.0
Color - -	3	Bicarbonate - -	7.0
pH - -	8.9	Sulfate - -	38
Silica - -	20	Chloride - -	4.5
Iron - -	0.02	Fluoride - -	0.1
Manganese - -	0.0	Nitrate - -	0.4
Calcium - -	12	Dissolved solids - -	91
Magnesium - -	1.2	Total hardness - -	35

The following material is taken from "Progress Report No. 2, Public Ground-Water Supplies in North Carolina, U. S. Geological Survey, Raleigh, 1949", prepared in cooperation with the State Board of Health. Ownership is municipal unless otherwise indicated.

Angier, Harnett County

Population - - 1940: 1,028 (1950: 1,182)
Source - - Well
Depth of well (ft.) - - 265
Diam. of well (in.) - - 10
Yield (g.p.m.) - - 60
Treatment - - Lime and rapid sand filtration

Samples collected - -	Oct. 28, 1948 (raw water)	Oct. 28, 1948 (treated water)
Color - -	4	6
pH - -	6.6	8.6
Silica - -	19	19
Iron - -	5.7	.68
Manganese	.28	.00
Calcium - -	7.2	15
Magnesium - -	5.0	5.0
Na + K - -	4.3	4.7
Bicarbonate - -	50	75
Sulfate - -	3.3	3.2
Chloride - -	2.1	2.0
Fluoride - -	.2	.2
Nitrate - -	.0	.0
Dissolved solids - -	65	83
Total hardness - -	38	58

Benson, Johnston County

Population - - 1940: 1,837 (1950: 2,102)
Source - - Well
Depth of well (ft.)- - 550
Diam. of well (in.) - - 10
Yield (g.p.m.) - - 200
Treatment - - None
Sample collected - - May 16, 1947

Color - -	3	Bicarbonate - -	129
pH - -	7.8	Sulfate - -	5.9
Silica - -	12	Chloride - -	54
Iron - -	.09	Fluoride - -	.2
Manganese - -	.00	Nitrate - -	.2
Calcium - -	17	Dissolved solids - -	214
Magnesium - -	6.9	Total hardness - -	71
Na + K - -	54		

Biscoe, Montgomery County

Population - - 1940: 843 (1950: 1,034)

Source - -	Well 1	Well 2	Well 3
Depth of well (ft.)	178	209	338
Diam. of well (in.)	8	8	8
Yield (g.p.m.)	20	16	75
Samples collected	3-10-48	3-10-48	3-10-48
Treatment	none	none	none

Biscoe, Montgomery County (continued)

	Well 1	Well 2	Well 3
Color	3	12	8
pH	7.2	6.7	7.2
Silica	30	30	52
Iron	.06	.88	.65
Manganese	.00	.00	.21
Calcium	24	12	32
Magnesium	5.8	5.5	4.1
Na + K	12	15	20
Bicarbonate	115	88	145
Sulfate	7.4	2.6	7.7
Chloride	4.5	6.8	8.5
Fluoride	.1	.1	.2
Nitrate	.8	1.1	.0
Dissolved solids	141	116	199
Total hardness	84	53	97

Burgaw, Pender County

Population - - 1940: 1,476 (1950: 1,613)
Source - - Well
Depth of well (ft.) - - 300
Diam. of well (in.) - - 8
Yield (g.p.m.) - - 120
Treatment - - Lime and pressure sand filter

Samples collected - -	7-6-47 (raw water)	7-6-48 (treated water)
Color	4	3
pH	7.4	7.3
Silica	24	24
Iron	2.0	.13
Manganese	.08	.00
Magnesium	9.3	9.2
Na + K	66	66
Bicarbonate	332	332
Sulfate	3.3	2.5
Chloride	8.0	8.0
Fluoride	.8	.9
Nitrate	.3	.2
Dissolved solids	318	317
Total hardness	146	145

Candor, Montgomery County

Population - - 1940: 409 (1950: 617)

Source - -	Well 1		Well 2	Well 3
Depth of well (ft.)	175		70	65
Diam. of well (in.)	8		8	6
Yield (g.p.m.)	23		15	10
Treatment - -	Caustic soda and filtration		none	none
Samples collected	12-20-48 (raw water)	12-20-48 (treated water)	12-20-48	12-20-48
Color	2	3	2	3
pH	6.8	5.2	5.0	7.5
Silica	24	2.9	4.2	10
Iron	7.4	.20	.07	.12

Candor, Montgomery County (continued)

Manganese - -	.23	.00	.00	.04
Calcium - -	11	.9	1.4	11
Magnesium - -	3.5	.9	.9	3.5
Na + K - -	8.1	2.4	9.0	5.9
Bicarbonate - -	60	2	1	48
Sulfate - -	6.7	.7	.9	2.8
Chloride - -	1.9	3.2	8.6	4.4
Fluoride - -	.2	.0	.0	.1
Nitrate - -	.1	5.2	16	7.4
Dissolved solids - -	84	22	47	71
Total hardness - -	42	6	7	42

Carthage, Moore County

Population - - 1940: 1,381 (1950: 1,194)
Source - - Springs
Treatment - - Chlorination and soda ash
Sample collected - - Nov. 6, 1946 (treated water)

Color - -	4	Bicarbonate - -	3
pH - -	5.4	Sulfate - -	.9
Silica - -	3.8	Chloride - -	4.5
Iron - -	.03	Fluoride - -	.1
Manganese - -	.00	Nitrate - -	7.2
Calcium - -	1.2	Dissolved solids - -	26
Magnesium - -	.5	Total hardness - -	5
Na + K - -	4.9		

Clinton, Sampson County

Population - - 1940: 3,557 (1950: 4,414)

Sources - -	Well 1	Well 2	Well 3
Depth of well (ft.) - -	385	385	385
Diam. of well (in.) - -	12	12	8
Yield (g.p.m.) - -	500	500	500
Treatment - -	none	none	none
Samples collected - -	4-20-48	4-20-48	7-14-49
Color - -	3	3	3
pH - -	6.9	6.8	6.4
Silica - -	29	32	21
Iron - -	4.9	.25	.49
Manganese - -	.00	.00	.00
Calcium - -	12	12	8.3
Magnesium - -	1.9	.7	1.7
Na + K - -	22	14	5.8
Bicarbonate - -	83	57	30
Sulfate - -	7.7	7.9	8.2
Chloride - -	6.2	5.5	4.8
Fluoride - -	.2	.3	.0
Nitrate - -	.1	.1	.4
Dissolved solids - -	123	104	70
Total hardness - -	38	33	28

Coats, Harnett County

Population - - 1940: 827 (1950: 1,047)
Owner - - F. A. Byrd

Coats, Harnett County (continued)

Source - - Springs
Treatment - - Chlorination
Sample collected - - 11-13-46 (treated water)

Color - -	2	Bicarbonate - -	4
pH - -	5.2	Sulfate - -	1.2
Silica - -	5.4	Chloride - -	15
Iron - -	0.3	Fluoride - -	.1
Manganese - -	.00	Nitrate - -	28
Calcium - -	2.6	Dissolved solids - -	81
Magnesium - -	1.7	Total hardness - -	14
Na + K - -	16		

Elizabethtown, Bladen County

Population - - 1940: 1,123 (1950: 1,611)

Sources - -	Well 1	Well 2
Depth of well (ft.) - -	235	235
Diam. of well (in.) - -	4	6
Yield (g.p.m.) - -	100	200
Treatment - -	none	none
Samples collected - -	2-26-46	2-26-46
Color - -	9	7
pH - -	7.0	7.5
Silica - -	33	33
Iron - -	.21	3.2
Manganese - -	.00	.00
Calcium - -	17	8.4
Magnesium - -	1.2	.7
Na + K - -	20	34
Bicarbonate - -	94	108
Sulfate - -	8.1	3.1
Chloride - -	3.4	4.2
Fluoride - -	.2	.4
Nitrate - -	.2	.2
Dissolved solids - -	129	139
Total hardness - -	47	24

Elon College, Alamance County

Population - - 1940: 494 (1950: 1,109)

Sources - -	Well 1	Well 2
Depth of well (ft.) - -	800	300
Diam. of well (in.) - -	10	8
Yield (g.p.m.) - -	24	40
Treatment - -	none	none
Samples collected - -	1-22-48	1-22-48
Color - -	0	0
pH - -	6.2	6.9
Silica - -	31	46
Iron - -	.05	.07
Manganese - -	.00	.00
Calcium - -	8.2	14
Magnesium - -	3.0	7.5
Na + K - -	3.5	5.9
Bicarbonate - -	46	84
Sulfate - -	1.8	4.0

Elon College, Alamance County (continued)

Chloride- -	2.9	3.0
Fluoride- -	.0	.0
Nitrate - -	1.4	1.7
Dissolved solids - -	76	124
Total hardness - -	33	66

Faison, Duplin County

Population - - 1940: 751 (1950: 768)

Sources:	Well 1	Well 2
Depth of well (ft.) - -	200	200
Diam. of well (in.)- -	8	8
Yield (g.p.m.)- -	90	100
Treatment - -	none	none
Samples collected - -	2-10-47	2-10-47
Color - -	56	8
pH - -	6.8	6.2
Silica - -	29	17
Iron - -	1.1	.34
Manganese - -	.15	.10
Calcium - -	15	6.7
Magnesium - -	2.0	.9
Na + K - -	6.7	6.5
Bicarbonate - -	61	25
Sulfate - -	5.1	7.0
Chloride - -	3.1	4.6
Fluoride - -	.2	.1
Nitrate - -	.0	.0
Dissolved solids - -	96	56
Total hardness - -	46	20

Fuquay Springs, Wake County

Population - - 1940: 1,323 (1950: 1,992)

Sources - -	Well 1	Well 2	Well 3	
Depth of well (ft.) - -	300	250	400	
Diam. of well (in.) - -	8	6	8	
Yield, (g.p.m.) - -	80	60	60	
Treatment - -	none	none	Pre-and post-chlorination, lime-alum, zeolite softening, and filtration	
Samples collected - -	2-25-47	2-25-47	2-25-47 (raw water)	2-25-47 (mixed, treated water)
Color - -	0	8	4	4
pH - -	7.1	6.8	7.4	8.7
Silica - -	50	50	49	50
Iron - -	.61	1.3	.29	.21
Manganese - -	.22	.66	.15	.00
Calcium - -	31	44	24	22
Magnesium - -	3.1	3.6	2.6	1.9
Na + K - -	11	10	8.5	57
Bicarbonate - -	116	134	88	134
Sulfate - -	8.8	5.1	13	9.7
Chloride - -	6.4	22	2.1	46

Fuquay Springs, Wake County (continued)

Fluoride - -	.2	.2	.2	.4
Nitrate - -	.0	.0	.0	.2
Dissolved solids - -	171	221	148	253
Total hardness - -	90	125	71	63

Gibsonville, Alamance and Guilford Counties

Population - - 1940: 1,753 (1950: 1,866)

Sources - -	Well 2	Well 3
Depth of well (ft.) - -	201	355
Diam of well (in.) - -	10	8
Yield (g.p.m.) - -	90	140
Treatment - -	none	none
Samples collected - -	7-17-47	7-17-47
Color - -	3	5
pH - -	6.4	6.6
Silica - -	38	42
Iron - -	.12	.13
Manganese - -	.00	.00
Calcium - -	14	17
Magnesium - -	6.1	4.3
Na + K - -	11	11
Bicarbonate - -	90	97
Sulfate - -	1.5	2.8
Chloride - -	4.2	1.8
Fluoride	.0	.0
Nitrate - -	3.9	.0
Dissolved solids - -	123	128
Total hardness - -	60	60

Graham, Alamance County

Population - - 1940: 4,339 (1950: 5,026)

Sources - -	Well 1	Well 3	Well 4	Well 5
Depth of well (ft.) - -	465	500	1,000	500
Diam. of well (in.) - -	8	8	8	8
Yield (g.p.m.)- -	20	40	40	-
Treatment - -	none	none	none	none
Samples collected	8-19-48	8-19-48	8-19-48	8-19-48
Color - -	4	2	2	2
pH - -	7.6	7.2	7.6	7.4
Silica - -	33	34	23	39
Iron - -	.26	.11	.19	.13
Manganese - -	.00	.00	.00	.00
Calcium - -	49	42	36	14
Magnesium - -	13	12	12	7.0
Na + K - -	11	8.6	14	6.6
Bicarbonate - -	186	170	159	56
Sulfate - -	17	11	9.8	5.4
Chloride - -	21	14	20	12
Fluoride - -	.0	.0	.1	.0
Nitrate - -	.8	2.8	1.0	12
Dissolved solids - -	242	217	193	132
Total hardness - -	176	154	139	64

Kenansville, Duplin County

Population - - 1940: 571 (1950: 674)		Manganese - -	.00
Source - -	Well	Calcium - -	42.
Depth of well (ft.) - -	196	Magnesium - -	1.5
Diam. of well (in.) - -	8	Na + K - -	5.5
Yield (g.p.m.) - -	150	Bicarbonate - -	138
Treatment - -	none	Sulfate - -	4.9
Sample collected - -	May 15,1947	Chloride - -	3.2
Color - -	6	Fluoride - -	.1
pH - -	7.9	Nitrate - -	.0
Silica - -	18	Dissolved solids - -	148
Iron - -	.09	Total hardness - -	111

Liberty, Randolph County

Population - - 1940: 922 (1950: 1,342)			
Sources - -	Well 1	Well 2	Well 3
Depth of well (ft.) - -	292	221	242
Diam. of well (in.) - -	8	8	10
Yield (g.p.m.)- -	120	60	60
Treatment - -	none	none	none
Samples collected - -	9-14-48	9-14-48	9-14-48
Color - -	3	2	2
pH - -	6.8	6.6	6.4
Silica - -	35	35	30
Iron - -	.09	.12	.29
Manganese - -	.10	.00	.00
Calcium - -	14	13	9.5
Magnesium - -	9.2	6.1	5.2
Na + K - -	8.6	7.4	7.4
Bicarbonate - -	97	82	64
Sulfate - -	7.4	2.1	2.4
Chloride - -	2.9	2.5	4.0
Fluoride - -	.0	.0	.0
Nitrate - -	.1	.8	.8
Dissolved solids - -	127	106	91
Total hardness - -	73	58	45

Lillington, Harnett County

Population - - 1940: 914 (1950: 1,061)			
Sources - -	Well 1	Well 2	Well 3
Depth of well (ft.) - -	305	8	22
Diam. of well (in.) - -	-	8	24
Yield (g.p.m.) - -	291	8	80
Treatment - -	none	none	none
Samples collected - -	11-10-47	11-10-47	11-10-47
Color - -	2	8	12
pH - -	6.3	7.4	6.6
Silica - -	12	22	29
Iron - -	.06	.51	1.7
Manganese - -	.08	.43	.39
Calcium - -	5.1	20	16
Magnesium - -	2.0	4.7	7.1
Na + K - -	9.8	17	17
Bicarbonate - -	32	89	82
Sulfate - -	1.7	7.6	29

Lillington, Harnett County (continued)

Chloride - -	7.8	18	5.4
Fluoride - -	.1	.2	.3
Nitrate - -	3.8	.0	.0
Dissolved solids - -	58	134	144
Total hardness - -	21	69	69

Mount Olive, Wayne County

Population - - 1940: 2,929 (1950: 3,732)

Sources - -	Well 1	Well 2	Well 3
Depth of well (ft.) - -	135	170	175
Diam. of well (in.) - -	10	10	10
Yield (g.p.m.) - -	90	160	150
Treatment - -	none	none	none
Samples collected - -	12-2-46	12-2-46	12-2-46
Color - -	2	12	17
pH - -	5.5	6.0	5.8
Silica - -	19	32	34
Iron - -	2.3	1.4	1.2
Manganese - -	.00	.08	.07
Calcium - -	4.9	7.9	4.3
Magnesium - -	.9	1.0	1.0
Na + K - -	4.6	9.5	11
Bicarbonate - -	17	39	31
Sulfate - -	6.5	5.9	5.8
Chloride - -	3.4	3.8	3.6
Fluoride - -	0.2	0.4	0.8
Nitrate - -	0.0	0.0	0.1
Dissolved solids - -	49	83	85
Total hardness - -	16	24	15

Raeford, Hoke County

Population - - 1940: 1,628 (1950: 2,030)

Sources - -	Well 1	Well 2
Depth of well (ft.) - -	75	75
Diam. of well (in.) - -	4	4
Yield (g.p.m.) - -	100	100
Treatment - -	Aeration and lime	Aeration and lime
Samples collected	12-20-46 (raw water)	12-20-46 (raw water)
Color - -	3	2
pH - -	4.6	4.7
Silica - -	5.8	5.9
Iron - -	.09	.09
Manganese - -	.00	.00
Calcium - -	.6	.6
Magnesium - -	.4	.4
Na + K - -	3.1	3.0
Bicarbonate - -	3	3
Sulfate - -	.7	.8
Chloride - -	3.2	2.8
Fluoride - -	.0	.1
Nitrate - -	2.6	2.6
Dissolved solids - -	18	19
Total hardness - -	3	3

Roseboro, Sampson County

Population - - 1940: 939 (1950: 1,241)		Manganese - -	1.3
Sources - -	8 wells	Calcium - -	.9
Depth of wells (ft.) - -	25	Magnesium - -	1.3
Diam. of wells (in.) - -	1.25	Na + K - -	17
Yield (g.p.m.) - -	112	Bicarbonate - -	6
Treatment - -	none	Sulfate - -	1.1
Sample collected - -	Mar. 10, 1948	Chloride - -	20
Color - -	2	Fluoride - -	.0
pH - -	5.1	Nitrate - -	12
Silica - -	4.8	Dissolved solids - -	67
Iron - -	.19	Total hardness - -	8

Rose Hill, Duplin County

Population - - 1940: 727 (1950:1,241)		Manganese - -	.00
Source - -	well	Calcium - -	52
Depth of well (ft.) - -	284	Magnesium - -	1.5
Diam. of well (in.) - -	8	Na + K - -	2.4
Yield (g.p.m.) - -	20	Bicarbonate - -	164
Treatment - -	none	Sulfate - -	.5
Sample collected	May 15, 1947	Chloride - -	4.2
Color - -	8	Fluoride - -	.1
pH - -	7.7	Nitrate - -	.1
Silica - -	18	Dissolved solids - -	166
Iron - -	.21	Total hardness - -	136

Star, Montgomery County

Population - - 1940:611 (1950: 677)

Sources - -	Well 1	Well 2	Well 3	Well 4
Depth of well (ft.)	180	200	300	313
Diam. of well (in.) - -	8	8	8	8
Yield (g.p.m.)- -	55	35	168	30
Treatment - -	none	none	none	none
Samples collected -	3-10-48	3-10-48	3-10-48	3-10-48
Color - -	8	8	2	13
pH - -	5.9	6.2	6.4	6.5
Silica - -	16	14	31	40
Iron - -	.04	.20	2.2	.40
Maganese - -	.00	.00	.22	.00
Calcium - -	2.9	7.5	10	13
Magnesium - -	1.2	1.0	2.0	1.0
Na + K - -	6.1	7.0	6.4	12
Bicarbonate - -	18	30	40	70
Sulfate - -	1.2	1.4	9.7	1.1
Chloride - -	4.9	7.2	2.8	2.8
Fluoride - -	.1	.1	.1	.1
Nitrate - -	2.8	2.0	.0	.0
Dissolved solids - -	46	58	82	105
Total hardness - -	12	23	33	37

Vass, Moore County

Population - - 1940: 728 (1950: 757)
Source - - Well

Vass, Moore County (continued)

Depth of well (ft.) - -	250	Calcium	28
Diam of well (in.) - -	8	Magnesium	9.1
Yield (g.p.m.) - -	30	Na + K	15
Treatment - -	none	Bicarbonate	152
Sample collected - -	July 10, 1947	Sulfate	9.3
Color - -	10	Chloride	4.0
pH - -	7.4	Fluoride	.2
Silica - -	40	Nitrate	.1
Iron - -	.22	Dissolved solids - -	183
Manganese - -	.00	Total hardness - -	107

Wallace, Duplin County

Population - - 1940: 1,050 (1950: 1,622)		Manganese - -	0.00
Source - -	Well	Calcium - -	62
Depth of well (ft.) - -	185	Magnesium - -	4.8
Diam. of well (in.) - -	8	Na + K - -	3.6
Yield (g.p.m.) - -	100	Bicarbonate - -	211
Treatment - -	none	Sulfate - -	1.4
Sample collected - -	May 15, 1947	Chloride - -	5.0
Color - -	4	Fluoride - -	0.2
pH - -	7.7	Nitrate - -	0.3
Silica - -	22	Dissolved solids - -	213
Iron - -	0.27	Total hardness - -	174

Warsaw, Duplin County

Population - - 1940: 1,483 (1950: 1,598)		
Sources - -	Well 1	Well 2
Depth of well (ft.) - -	110	100
Diam. of well (in.) - -	10	10
Yield (g.p.m.) - -	-	-
Treatment - -	none	none
Samples collected - -	10-22-48	10-22-48
Color - -	3	2
pH - -	7.6	7.3
Silica - -	21	18
Iron - -	.38	.36
Manganese - -	.15	.06
Calcium - -	32	56
Magnesium - -	4.1	1.0
Na + K - -	14	5.8
Bicarbonate - -	144	179
Sulfate - -	3.8	4.0
Chloride - -	3.8	3.9
Fluoride - -	.1	.0
Nitrate - -	.1	.1
Dissolved solids - -	151	177
Total hardness - -	97	144

Water Supplies in Alamance and Guilford Counties - Bulletin No. 55, entitled "Geology and Ground Water in the Greensboro Area by M. J. Mundorff", published in 1948 by the North Carolina Department of Conservation and Development and prepared in cooperation with the Geological Survey, U. S. Department of the Interior, contains the following information regarding water supplies in the

Cape Fear River Basin. The "Greensboro Area" comprises Alamance, Caswell, Forsyth, Guilford, Rockingham, and Stokes Counties, and includes parts of the Cape Fear, Roanoke, and Yadkin-Pee Dee River Basins.

Alamance County - Most of the domestic and industrial water supplies, and two of the four municipal supplies, are obtained from wells. A few domestic supplies are obtained from springs. A great many of the domestic wells are dug, particularly on farms because the farmer can dig his own well during slack seasons. Nearly all of these wells obtain their water from the weathered and disintegrated zone between the soil and the underlying weathered-rock. In some places, dug wells have been unsuccessful because the underlying rock is so close to the surface. Either the water table is below the top of the rock or so close to it that little water can be obtained under normal conditions, and, during periods of drought, the well goes completely dry. At many places, it has been necessary either to deepen the well by blasting or drilling in the bottom, or to drill a new well. Usually, the well has been deepened by drilling in the bottom, and a great many wells in the vicinity of Burlington and Graham were thus deepened during the drought of 1941-1942. The failure of dug wells was not confined to any one rock type in Alamance County, and it appears that the rock in all four units - greenstone schist, slate, sheared granite, and diorite - will be so close to the surface at some places as to make dug wells unsatisfactory.

Bored wells are used chiefly in suburban areas just beyond the limits of public water-supplies. As these wells can be constructed only in completely-weathered rock, they cannot be used at many places. Many of these also went dry during the 1941-1942 drought and were deepened by drilling in the bottom.

Many wells have been drilled in Alamance County, and recently there has been a definite trend towards drilled wells, particularly since so many dug and bored wells failed during the drought of 1941-1942. Both core-drilled wells, 2 or 3 inches in diameter, and percussion-drilled wells, 4 to 8 inches in diameter, are used. Most wells, drilled in the bottom of dug or bored wells, are 6 inches in diameter and have been churn-drilled.

The average depth of wells in greenstone schist and granite is considerably greater than the average depth of wells in the slates and diorites, probably owing to the considerable number of relatively-deep municipal and industrial wells included in the first two units. The average yield of wells in the greenstone schist and granite is nearly the same. Although the average yield of wells in the greenstone schist is slightly larger than the average yield of wells in granite, the average yield per foot of wells in granite, because of the greater depth of wells in the greenstone schist, is slightly greater than in greenstone schist.

The average yield per foot of well is considerably greater for wells in the slates than for wells in any other rock. This is rather surprising because the greenstone schist ranks well ahead of the slates for the Greensboro Area as a whole. The average yield, and average yield per foot of well for all wells in Alamance County, is considerably greater than for the entire Greensboro Area.

The average yield, and average yield per foot of wells drilled in draws, is greater than for wells drilled on hills, on slopes, on flats, and in valleys. Hills should be avoided in selecting well sites. Wells located so as to intersect quartz veins frequently obtain yields of water much greater than average. Wells that intersect one or more dikes probably yield more water than those drilled entirely in granite. Well sites should be selected where there is a

thickness of the mantle, the layer of soil and disintegrated rock in which the water from the surface accumulates and is fed into the fractures and joints of the underlying rock.

The following information regarding chemical and physical character of ground water in Alamance County was obtained from analyses of 12 samples from wells, five from wells in green-stone schist, four from wells in slate, two from wells in granite, and one from a well in diorite.

The iron content ranged from 0.0 to 0.5 part per million. In only one sample was the iron content more than 0.03 part per million. The water from the greenstone schist ranged in hardness from 30 to 148 parts per million and in iron content from 0.01 to 0.5 part per million.

The water from the slate ranged in hardness from 3.2 to 480 parts per million. However, the water from three of the four samples was soft. In only two of the analyses is the iron content reported, and in both of these it is 0.01 part per million. The two analyses of water from wells in granite are nearly identical. Both are of hard water and show a low iron-content. The water from the well in diorite is similar to the water from the wells in granite. Temperatures range from 60° to 63° F. and average 62° F.

There are four municipal water-supplies in Alamance County. Wells are the source of two of these, and streams are the source of the other two. In addition to the municipal supplies, many houses in several villages are supplied with water from wells or streams, through distribution systems owned and operated by the mills around which the villages are located.

Burlington, the largest city, had a 1940 population of 12,198 (1950 population: 24,560), and has had a municipal supply since 1905. From 1905 to 1921, the supply was obtained from wells, including wells 76, 77, and 113 in the tables (pages 56 and 57, Bulletin No. 55). Well 113 is now (1948) being used by the May Hosiery Mills of May, McEwan, Kaiser Co., Inc. In 1920, the yield from the wells became insufficient, and a surface supply was developed which was first used during Christmas week of 1920. The water is obtained from Stony Creek (a tributary of Haw River), three miles northeast of the center of Burlington (and impounded in Lake Burlington). The dam is 30 feet high, and the lake has an area of 140 acres and a capacity of 500 million gallons. Four electrically-driven centrifugal pumps, with a total capacity of 9,000 gallons a minute, force the water to a 1,750,000-gallon raw-water reservoir at the treatment plant in the city. Treatment consists of coagulation with the addition of alum and lime, filtration, and chlorination. The water flows by gravity from the raw-water reservoir, through the treatment plant, into the clear-water basin which has a capacity of 450,000 gallons. The treatment plant has a capacity of four million gallons a day. Distribution pumps consist of one diesel-driven and two electrically-driven centrifugal pumps with a total capacity of 5,950 gallons a minute. Pressure ranges from about 50 to 70 pounds per square inch. A 100,000-gallon elevated tank and a 1,500,000-gallon elevated tank are connected to the mains to furnish additional storage and equalize pressure. There are about 3,400 taps. The maximum consumption in 1942 was about 4,000,000 gallons a day, and the average was about 3,000,000 gallons a day.

The water supply for Elon College, 1940 population: 494 (1950 population: 1,109), is obtained from two drilled wells, numbers 132 and 133 in the table (page 58, Bulletin No. 55). Well 132 is 300 feet deep and has a tested yield of 150 gallons a minute. The pump, however, has a capacity of only 60 gallons a

minute. Well 133 has a capacity of 23 gallons a minute. Both wells are in greenstone schist. The electrically-driven pumps deliver the water into the distribution system. The total capacity of the pumps is about 85 gallons a minute. A 50,000-gallon tank is connected to the system, furnishes storage, and equalizes the pressure which is maintained at about 45 pounds per square inch. There are about 90 taps, and the water consumption is about 70,000 gallons a day. The water is not treated.

Graham, 1940 population: 4,339 (1950 population: 5,026), has had a public water supply since 1906. The water is obtained from six drilled wells, numbers 55 through 60 in the tables of well data (page 56, Bulletin No. 55). The depths of the wells range from 354 to 1,005 feet, and yields range from about 30 to 45 gallons a minute. All of the wells are believed to be in greenstone schist. Wells 56 and 57, pumped by air lift and piston pump, respectively, discharge into a 500,000-gallon, round, concrete reservoir. A 75,000-gallon elevated tank furnishes additional storage and equalizes the pressure. The other wells are equipped with turbine pumps and discharge directly into the system. The pumping level is about 225 to 250 feet below the surface. The maximum capacity is about 300,000 gallons a day. Maximum consumption is about 280,000 gallons a day, and the average is about 250,000 gallons a day. The water is not treated.

Mebane, 1940 population: 2,060 (1950: 2,068), has had a public supply since 1919. The chief source of supply is Mill Creek, about 1.25 miles north of the town. Well 26 (page 55, Bulletin No. 55), located at the water plant in the north edge of Mebane, is used as an auxiliary supply. The well is 735 feet deep in slate and yields 25 gallons a minute. The water is pumped from Mill Creek by two centrifugal pumps, and the well is equipped with a deep-well piston pump. The largest storage is a 250,000-gallon, round, concrete reservoir. A 75,000-gallon elevated-tank furnishes additional storage and equalizes the pressure on the system. Treatment consists of coagulation with addition of alum, filtration, and chlorination. The capacity of the plant is about 400,000 gallons a day. Consumption averages about 175,000 gallons a day, and the maximum is about 200,000 gallons a day. During the drought of 1941, the supply from Mill Creek was inadequate. Wells 26, 28, and 30 (the latter two of which are owned by Mebane Royal Company and Mebane Yarn Mills, Inc., respectively) were used to supplement the supply. Since this supplement was insufficient, additional water was obtained from another small creek about three miles north of Mebane.

The water supply at the village of Alamance is owned and operated by the Standard Hosiery Mills, Inc. The source is Great Alamance Creek, at the dam. Treatment consists of coagulation with alum, soda ash, and lime, filtration, and chlorination. Storage is in a 75,000 gallon elevated-tank, 50,000 gallons of water being held in reserve in case of fire. Water is supplied to about 40 or 50 families, in addition to the mill. Consumption averages about 150,000 gallons a day, most of which is used in the mill.

At Belmont, wells 157 to 160 (page 58, Bulletin No. 55), belonging to Burlington Mills Corporation, supply a number of homes. The wells are 80 to 185 feet deep and 2 inches in diameter, and yield 2.5 to 5 gallons a minute each.

At Swepsonville, the mills and many homes are supplied with water from wells 169 to 171 and 174 to 177 (page 58, Bulletin No. 55), belonging to Virginia Mills Company, Inc. These wells range from 58 to 408 feet in depth and from 2 to 8 inches in diameter. Yields range from 1 to about 25 gallons a minute. The wells apparently are in diorite.

Wells 194 and 195 (page 59, Bulletin No. 55) at Saxapahaw, drilled in slate,

supply the mills and village. These wells, owned by the Sellars Manufacturing Company, are 168 and 204 feet deep, respectively, are 6 inches in diameter, and yield 30 and 32 gallons a minute, respectively.

Guilford County - Nearly all domestic supplies, many industrial supplies, and one of the three municipal water supplies are obtained from wells.

Dug wells are extensively used for domestic supplies in rural districts. Generally, they are from about 15 to 50 feet deep and 2.5 to 4 feet in diameter. Wells can generally be dug deep enough in gneiss and schist that they will not go dry even during a drought. However, at some places in granite, diorite, greenstone schist, and slate, the rock is so close to the surface that dug wells frequently go dry.

Bored wells are used considerably in suburban areas and are easily and cheaply constructed. They are bored by power-driven earth augers and cannot go below the completely-weathered zone. For this reason, they are not always successful in rocks such as granite and diorite where the water table, at times, declines below the weathered zone. Most bored wells are cased and, where they are properly constructed and of sufficient depth that they will not go dry, they are a satisfactory source of supply. Dug and bored wells obtain their water from the weathered rock-material at and just below the water table. For this reason, extra precautions must be observed to prevent contamination.

There are a large number of drilled wells in Guilford County. Records of more than 350 drilled wells are given in the tables of well data (pages 80-89, inclusive, Bulletin No. 55). Many of these were core-drilled with chilled shot and are 2 to 3 inches in diameter. There are many other core-drilled wells in Guilford County which do not appear in the tables. Core-drilled wells have the advantages of all drilled wells and are cheaper than the larger percussion-drilled wells. However, although they are satisfactory for domestic wells, their small size makes them unsatisfactory for most industrial plants. About 7 or 8 gallons a minute is the maximum rate at which water can be removed from a 2-inch well by a deep-well pump. The average yield of 157 wells, 2 inches in diameter, in Guilford County is 6 gallons a minute, and the average yield of 20 wells, 3 inches in diameter, is 10.5 gallons a minute. These quantities are near the maximum amount that can be pumped from wells of that diameter and suggest that many of the wells would yield more than can be withdrawn from them.

Most industrial and public-supply wells are drilled with percussion drills and are from 4 to 8 inches in diameter. The 6-inch well is by far the commonest. The larger-diameter wells encounter more fractures and cracks than small-diameter wells. Also, because a larger pump can be used, more water can be pumped from a large-diameter well than from a small-diameter well.

Drilled wells, both core-drilled and churn-drilled, have certain advantages over dug or bored wells. Becuase they are generally tightly-cased and the water is obtained from crevices in the rock, they are much less liable to contamination. The depth of water in the well is generally large in comparison with the fluctuation of the water level, so that the yield decreases only slightly during a drought.

Wells in greenstone schist have by far the greatest average yield and average yield per foot of well. Wells in the gneiss-unit rank second, both in average yield and average yield per foot of well. Wells in sheared granite rank third in average yield but are fourth in average yield per foot of well, being exceeded in that respect by wells in sericite-schist. Wells in the porphyritic-

granite rank fifth in both respects, and wells in slate are sixth and lowest. However, data on only four wells in slate were included in the comparison, one of which was very deep and had a low yield. If this one well had been omitted, the record for the wells in slate would have been more than twice as good.

Although the greenstone schist is generally an excellent aquifer, at some places it is not so good. In the vicinity of Whitsett and southwestward thereof, it apparently yields rather meagerly. Wells in the greenstone schist, between Greensboro and Browns Summit and in the vicinity of Sedgefield, have not been uniformly successful. Fortunately, at most places where water is needed for industrial purposes, excellent wells have usually been obtained.

More wells are drilled in granite, including together the sheared granite and porphyritic granite, than in any other rock. Results have generally been quite uncertain. No particular area can be designated as unusually poor, except possibly the vicinity of the County Home just east of Greensboro, and no areas can be designated as unusually good. At a number of places where a well, several hundred feet deep, was drilled and only a few gallons a minute were obtained, a second well, drilled a few hundred feet away, obtained several times as much water. It is apparent that the success or failure of a well depends on encountering fractures and joints in the rock. Wells, drilled on hills, have by far the lowest average yield and average yield per foot of well. Wells in valleys have much the highest average yield and average yield per foot of well. Wells in draws are second, on slopes third, and, in flat areas, fourth. Wells on hills have an average yeild 30 percent less, and an average yield per foot of well 42 percent less, than wells drilled on flat areas. A hill is a poor location for a well because it is quite commonly underlain by rock which is more resistant to erosion. In many places, the rock is resistant to erosion because it has few fractures, joints, and similar openings facilitating the movement of ground water, which promote weathering and thus make the rock easily susceptible to erosion. Naturally, if the avenues of movement of ground water are limited, the amount of water yielded by a well drilled there will be small.

Analyses of eight samples of water from wells in Guilford County are given in the table of analyses (page 89, Bulletin No. 55). Seven of the samples are from wells in granite, and one is from a well in greenstone schist. The seven samples from the granite ranged from soft to very hard and from 0.0 to 0.04 part per million in iron-content. There is evidence of considerable contamination in some of the samples. The water from the well in greenstone schist, which has a relatively-large amount of chloride, sulfate, and nitrate and, therefore, appears to be somewhat contaminated, is moderately hard. Temperatures range from 59° to 63° F. and average 61° F.

Gibsonville has had a public supply since 1822, obtaining its water from two deep wells, one in Guilford County and the other in Alamance County. Well 234, Guilford County (page 86, Bulletin No. 55), is 201 feet deep and yields 100 gallons a minute. Well 139, Alamance County (page 83, Bulletin No. 55), is 335.5 feet deep. It was tested at 112 gallons a minute but is now (1948) being pumped at about 45 gallons a minute. Well 233, Guilford County, constructed by the City of Gibsonville, is only a short distance from Well 234. The pumping of the one causes a large drawdown in the other, so Well 233 was abandoned. Log of Well 233 is shown on page 90, Bulletin No. 55. The turbine pump on Well 234 discharges into a 154,000-gallon, concrete reservoir. Centrifugal pumps force the water into the mains. A 75,000-gallon elevated-tank gives additional storage. Well 139 pumps directly into the mains. The water from neither well is treated. Consumption of water averages about 55,000 gallons a day.

Greensboro obtains its water from an impounded lake on Reedy Fork and Horsepen Lake, about 7 miles north of the city. The lake covers an area of 450 acres and has a capacity of one billion gallons. An auxiliary reservoir, a mile south of the lake and 120 feet higher, gives additional raw-water storage of 20 million gallons. The water is pumped to the treatment plant in the city through a 24-inch line by three steam-driven centrifugal pumps and one water wheel. Water treatment consists of coagulation with alum, filtration, chlorination, and final adjustment of pH with lime. There are two concrete clear-water reservoirs with capacities of 3 million and 18 million gallons, respectively, and two elevated tanks with capacities of 250,000 and 500,000 gallons, respectively. The capacity of the treatment plant is 12 million gallons a day. The maximum consumption is about seven million gallons a day, and the average is about 5.5 million gallons a day. About 25 percent of the water is used by industries.

In addition to the municipal water plant in Greensboro is the Buffalo Water Works, owned by the Proximity Manufacturing Company. Water is obtained from Buffalo and Richland Creeks. The total capacity of the storage lakes on these creeks is about one billion gallons. The water is treated by coagulation with alum and lime, filtration, final adjustment of pH with lime, and chlorination. The filter plant has a capacity of about 4.5 million gallons a day. Filter plants at some of the mills increase the capacity to about 8.5 million gallons a day. The total consumption is about 8 million gallons a day, most of which is used by the mills.

High Point obtains its supply from an impounded lake on Deep River 5 miles northeast of the city. The dam is 45 feet high, and the lake has an area of 350 acres. The water flows by gravity 4,000 feet through a 30-inch pipe to the raw-water pumping station. Four electrically-driven centrifugal pumps with a total capacity of eight million gallons a day, and one gasoline-driven pump with a capacity of 3.5 million gallons a day, pump the water to the treatment plant through parallel 24-inch and 12-inch lines. Treatment consists of coagulation with alum, the addition of ammonia and chlorine, filtration, secondary chlorination, and final adjustment of pH with lime. The clear-water reservoir has a capacity of 3.2 million gallons, and a 1,000,000-gallon elevated tank furnishes additional storage. The pumps on the distribution system exactly duplicate the raw-water pumping system. The capacity of the treatment plant is six million gallons a day. The maximum consumption is about four million gallons a day, and the average is about 3.5 million gallons a day.

Date regarding Agricultural Production - Information regarding farm population, total land in farms, harvested croplands, idle cropland, and use of fertilizer, according to the 1952 Farm Census of 1951 crops, for the counties within or partially within the Cape Fear River Basin is shown below. Approximate figures for the portions of these counties that lie within the Basin may be obtained by using the following percentages: Alamance - 100%, Bladen - 67%, Brunswick - 12%, Caswell - 17%, Chatham -100%, Cumberland - 100%, Duplin - 100%, Durham - 25%, Guilford - 100%, Harnett - 100%, Hoke - 33%, Lee - 100%, Moore - 75%, New Hanover - 33%, Orange 33%, Pender - 100%, Randolph - 50%, Rockingham - 33%, and Sampson - 100%.

The figures shown in the table on page 52 are in acres, unless otherwise indicated.

Permits to use Water for Irrigation - The following permits to use water in the Cape Fear River Basin for the purpose of irrigation have been issued by the Director of the Department of Conservation and Development in accordance with the provisions of Section 113-8.1, General Statutes of North Carolina, as amended.

Permit Number	Name	Address	Source	Amount (c.f.s.)
		Alamance County		
215	W. L. Stanfield	R#3, Mebane	Black Creek	0.73
323	H. J. Thiel	R#2, Burlington	Br. of Buttermilk Cr.	1.30
674	H. J. Thiel	R#2, Burlington	Buttermilk Cr.	0.42
714	J. H. Rascoe	R#3, Burlington	Br. of Stoney Cr.	0.27
667	N. R. Franks	Box 302, Elon College	Br. of Tickle Cr.	0.43
861	N. M. Simpson	R#2, Elon College	Travis Creek	0.64
		Bladen County		
460	E. K. Phillips	R#2, Council	Br. of Cape Fear R.	0.49
539	J. V. Fowler	Box 257, Olivia	Br. of Cape Fear R.	1.45
519	C. C. Sholar	R#2, Elizabethtown	Br. of Ellis Cr.	0.61
420	Mrs. J. C. Butler	Box 52, Roseboro	Br. of South River	1.43
		Brunswick County		
None				
		Caswell County		
316	D. A. Byrd	R#2, Burlington	Br. of Toms Cr.	0.52
860	N. M. Simpson	R#2, Elon College	Gray Creek	0.64
		Chatham County		
203	H. V. Cook	R#3, Chapel Hill	Cub Creek	0.41
303	The Gould Farm	Box 25, Pittsboro	Robeson Creek	0.66
42	R. B. Farrar	R#2, Apex	New Hope River	1.47
732	Lonnie Sexton	R#3, Apex	Br. of New Hope River	0.36
		Columbus County		
None				

ITEM	Alamance County	Bladen County	Brunswick County	Caswell County	Chatham County	Cumberland County	Duplin County	Durham County	Guilford County	Harnett County	Hoke County	Lee County	Moore County	New Hanover County	Orange County	Pender County	Randolph County	Rockingham County	Sampson County	Total for Counties in Cape Fear River Basin
Harvested Cropland	59,391	76,996	32,452	54,464	46,524	95,233	132,698	25,980	88,744	117,630	- -	29,040	45,458	6,601	41,228	40,878	78,131	70,930	181,779	1,224,157
Idle Cropland	29,243	9,173	7,599	26,734	27,259	13,759	11,482	11,179	43,811	10,632	- -	8,035	23,400	2,987	17,943	11,766	38,248	26,713	10,962	330,925
Pasture	31,233	8,261	3,843	19,516	28,688	9,147	15,907	12,155	43,719	9,807	- -	7,518	11,290	1,101	22,034	7,460	33,527	31,674	10,974	307,854
Woods,Home-Sites,etc.	122,471	225,129	143,080	164,753	223,096	171,161	234,694	88,360	167,923	187,938	- -	80,956	187,033	15,659	131,991	145,945	247,441	201,201	295,816	3,034,647
Corn Harvested	17,930	38,341	13,205	15,883	17,218	34,517	78,423	8,403	22,624	46,192	- -	9,681	14,856	1,704	12,866	18,281	24,455	19,074	78,860	472,513
Cotton Harvested	138	5,874	444	- -	1,101	19,553	6,476	168	222	20,704	- -	1,895	3,038	138	175	624	266	- -	36,776	97,592
Tobacco Harvested	6,819	11,322	4,998	14,114	4,078	8,278	23,742	5,504	13,623	22,570	- -	6,260	6,918	257	5,101	4,984	4,866	19,556	24,057	187,047
Peanuts	61	6,422	2,552	- -	57	646	602	- -	7	3	- -	12	180	382	- -	2,645	85	9	995	14,658
Wheat	9,337	522	174	6,029	7,671	4,078	670	1,828	12,344	4,447	- -	2,371	4,745	9	4,306	163	15,338	7,937	2,431	84,400
Oats	7,883	3,275	1,904	1,429	8,108	4,739	1,519	1,500	9,431	5,414	- -	3,640	3,769	201	4,418	1,011	12,899	3,253	3,370	77,763
Other Small Grains	1,003	367	267	393	975	1,090	348	612	2,527	737	- -	298	1,685	52	901	197	2,362	1,847	608	16,269
Soybeans	2,113	5,765	2,506	76	347	13,471	4,879	129	626	6,477	- -	198	300	512	955	3,522	884	106	14,968	57,804
Lespedeza	2,568	151	94	456	2,232	551	301	116	2,417	304	- -	130	1,229	- -	465	156	4,885	495	412	16,942
Hay Crops Harvested	13,833	5,271	3,156	12,921	11,485	7,964	5,439	6,405	22,899	11,199	- -	5,901	5,170	331	21,899	3,191	18,915	13,469	8,109	120,792
Other Hays Cut	1,275	122	823	1,338	4,714	552	353	901	2,212	353	- -	130	376	73	2,212	365	1,714	2,341	1,474	77,222
Irish Potatoes	132	59	82	322	337	180	165	157	299	165	- -	101	167	9	299	68	264	317	705	9,785
Sweet Potatoes	107	292	1,240	270	540	352	770	234	286	770	- -	161	200	102	286	313	230	288	1,051	7,197
Other Vegetables Grown	819	272	914	130	706	1,346	1,135	481	1,395	1,135	- -	68	455	2,334	1,395	2,557	1,718	576	8,282	18,102
Other Crops Harvested	2,102	2,064	1,406	2,008	1,481	3,210	2,963	808	3,652	3,171	- -	1,404	3,796	783	1,954	1,976	2,332	3,689	3,143	41,942
Total Land in Farms	242,308	319,559	186,979	265,467	325,567	289,570	394,771	137,674	344,197	326,007	- -	125,549	267,191	26,348	213,196	206,049	397,347	330,518	499,531	4,897,818
Total Land Area	277,760	562,560	558,720	278,400	452,480	423,040	526,080	191,360	416,640	387,840	264,960	163,200	430,080	124,160	254,720	548,480	512,640	366,080	338,700	7,077,900
Comm. Fert. Used,Tons	11,641	17,319	8,398	12,602	9,378	20,039	37,892	5,808	17,748	35,190	- -	3,530	10,479	2,717	8,000	10,639	13,092	18,909	45,651	294,032
Sows and Gilts, No.	748	3,048	1,769	958	1,411	2,412	6,166	358	833	2,758	- -	372	447	125	582	1,879	1,092	426	5,400	30,784
Cows and Heifers, No.	8,319	3,921	1,400	4,639	7,846	3,404	4,516	3,348	8,591	3,531	- -	1,863	2,912	340	5,716	1,948	9,508	6,692	4,851	83,345
Hens and Pullets, No.	84,343	80,237	40,617	65,811	101,264	70,523	133,378	56,570	112,769	121,816	- -	42,859	56,125	15,685	138,475	45,060	150,700	99,781	189,812	1,605,825
Tractors in Usable Condition, No.	1,303	975	613	904	1,009	1,006	1,902	498	1,717	1,716	- -	569	862	159	870	722	1,729	1,442	2,142	20,138
Farm Population, No.	17,620	18,087	12,128	15,941	13,717	19,121	27,630	9,919	26,106	26,730	- -	9,324	13,726	4,781	11,927	10,930	22,465	22,504	32,863	315,519
Total Population, 1950, No.	71,220	29,703	19,238	20,870	25,393	96,006	41,074	101,639	191,057	47,605	15,756	23,456	33,129	63,342	34,435	18,423	50,804	64,816	49,780	997,746

Cumberland County

Permit Number	Name	Address	Source	Amount (c.f.s.)
413	Gillis Bros. Farms	R#3, Fayetteville	Little Rockfish Cr.	1.15
392	W. T. Barbour	R#3, Fayetteville	Br. of Rockfish Cr.	1.02
575	D. F. McInnis	R#3, Fayetteville	Middle Cr.	0.37
399	Allen Marsh	R#7, Fayetteville	Br. of Grays Cr.	0.68
255	W. B. Honeycutt	R#1, Stedman	Little Cr.	0.52
305	C. R. Eason	R#1, Wade	Br. of South R.	0.40
385	J. H. Bullard	R#2, Autryville	Br. of South R.	0.27
389	E. E. Currin	R#6, Fayetteville	Br. of Cape Fear R.	1.12
749	J. A. Hair	R#7, Fayetteville	Br. of Rockfish Cr.	0.25

Duplin County

307	R. B. Sitterson	Kenansville	Northeast Cape Fear R.	0.54
353	W. W. Whitfield	R#1, Mt. Olive	Br. of N.E. Cape Fear R.	0.55
670	Mary B. Parker	Chinquapin	Northeast Cape Fear R.	2.65
64	Duplin Dairy Farm	Box 191, Wallace	Rock Fish Cr.	2.22
630	T. N. Surles	R#1, Warsaw	Br. of Stewarts Cr.	0.54
218	R. R. Best	R#3, Faison	Gravely Br.	0.28

Durham County

None

Forsyth County

None

Guilford County

785	J. T. Woodward	R#1, McLeansville	Br. of Reedy Fk. Cr.	0.28
691	Mrs. Ninnie Case	Box 194, Oak Ridge	Br. of Haw River	0.33
8	J. W. Homewood	500 S. Elm St.,G'boro	Br. of E. Prong Deep R.	0.35
374	W. H. Stewart	R#1, Whitsett	Big Alamance Cr.	0.52
823	C. A. Case	Box 194, Oak Ridge	Haw River	0.32
824	C. A. Case	Box 194, Oak Ridge	Br. of Haw River	0.32
825	C. A. Case	Box 194, Oak Ridge	Br. of Haw River	0.32

Harnett County

622	J. A. Langdon, Jr.	R#2, Angier	Br. of Black R.	0.84
267	Overhills Farms	Overhills	Jumping Run Cr.	0.50
268	Overhills Farms	Overhills	Br. of Lower Little R.	0.61
48	Tom Pemberton	Linden	Lower Little River	0.57
397	W. B. Castleberry	R#6, Sanford	Br. of Big Branch	0.91
47	Tom Pemberton	Linden	Anderson Creek	0.57
46	J. H. Williams	R#1, Erwin	Anderson Creek	0.47
430	J. R. Jones & Son	R#1, Fuquay Springs	Br. of Parkers Cr.	1.02
702	J. R. Jones & Son	R#1, Fuquay Springs	Br. of Avents Creek	1.02
641	B. F. McLeod, Jr.	Fuquay Springs	Br. of Avents Creek	0.36
338	John Douglas	R#1, Holly Springs	Br. of Hector Cr.	0.72
640	B. F. McLeod, Jr.	Fuquay Springs	Br. of Hector Cr.	0.36
666	L. W. Rollins	R#1, Fuquay Springs	Br. of Hector Cr.	0.34
643	Mitchell Farms	R#1, Sqring Lake	Lower Little R.	1.14
702	J. R. Jones & Son	R#1, Fuquay Springs	Br. of Avents Cr.	1.02

Permit Number	Name	Address	Source	Amount (c.f.s.)
		Hoke County		
225	N. L. McFayden	Box 126, Raeford	Beaver Cr.	0.74
574	W. L. Poole, Jr.	Raeford	Br. of Beaver Cr.	0.76
603	C. E. Jackson	R#1, Lumber Bridge	Br. of Rockfish Cr.	0.60
415	Gillis Bros.Farm	R#3, Fayetteville	Gully Branch	1.15
414	Gillis Bros. Farm	R#3, Fayetteville	Stewarts Creek	1.15
598	J. R. Plummer	R#2, Raeford	Little Rockfish Cr.	1.14
		Johnston County		
None				
		Lee County		
843	W. H. Owens	R#3, Sanford	Deep River	0.62
		Montgomery County		
731	J. E. Baldwin	Biscoe	Br. of Cabin Creek	1.68
		Moore County		
297	Ewing & Clark	Candor	Br. of Little R.	3.11
510	D. H. Wilson	R#1, West End	Broadhead Br.	0.68
		New Hanover County		
None				
		Onslow County		
None				
		Orange County		
340	C. F. Andrews Estate	R#1, Chapel Hill	Morgan Cr.	0.24
37	L. R. Cheek & Sons	R#1, Chapel Hill	Morgan Cr.	0.51
41	T. W. Brown	R#2, Chapel Hill	New Hope Cr.	0.27
		Pender County		
439	D. N. Lucas	Burgaw	Br. of Long Cr.	0.45
448	W. E. Henry	Box 429, Clinton	Long Cr.	0.87
402	Howard Peay	Rocky Point	Br. of N.E. Cape Fear R.	0.34
217	William Cochran, Jr.	R#1, Burgaw	Br. of N.E. Cape Fear R.	0.31
628	Charles Cutts	Box 593, Burgaw	Northeast Cape Fear R.	0.70
		Randolph County		
None				
		Rockingham County		
196	J. B. Waynick	Box 786, Reidsville	Br. of Little Cr.	0.43
186	Henry Tate	R#6, Reidsville	Br. of Troublesome Cr.	0.29
658	W. L. Patterson	R#1, Reidsville	Little Troublesome Cr.	0.31
885	R. O. Jones	R#1, Reidsville	Long Branch	0.30
886	R. O. Jones	R#1, Reidsville	Troublesome Cr.	0.30

SAMPSON COUNTY

Permit Number	Name	Address	Source	Amount (c.f.s.)
377	M. L. Gilbert	R#2, Dunn	Br. of Mill Cr.	0.40
158	C. M. Butler	R#1, Clinton	Br. of Great Coharie Cr.	0.67
209	P. H. Sinclair	R#3, Clinton	Br. of Beaver Dam Swp.	0.75
450	Allie McCuller	R#3, Clinton	Br. of Beaver Dam Swp.	0.72
264	D. A. Wiggins	Box 115, Clinton	Watsons Mill Cr.	0.88
159	C. Marion Butler	R#1, Clinton	Br. of Great Coharie Cr.	0.67
161	J. E. Floye	R#5, Clinton	Br. of Great Coharie Cr.	0.25
261	R. V. Gore	Clinton	Watsons Mill Cr.	0.66
362	E.C. & Tom Newman	Clinton	N. Prong Br.	1.46
363	A. M. Gore	Clinton	Br. of Great Coharie Cr.	0.46
263	Ennis Bass	R#3, Clinton	Br. of Great Coharie Cr.	0.84
335	A. A. Tyndell	R#3, Clinton	Br. of Great Coharie Cr.	0.34
459	S. A. Butler	Box 654, Clinton	Dollar Br.	0.53
334	J. W. Johnston	R#1, Parkersburg	Wrights Mill Br.	0.66
359	J. R. Oliver	R#1, Parkersburg	Rattlesnake Br.	0.37
135	C. D. DuBose	First Citizens Bank and Trust Co., Clinton	Great Coharie Cr.	0.76
324	Jim Oliver	R#1, Parkersburg	Rattlesnake Br.	0.31
137	C. D. Dubose	First Citizens Bank and Trust Co., Clinton	Little Coharie Cr.	0.76
138	C. D. Dubose	First Citizens Bank and Trust Co., Clinton	Br. of Coharie Cr.	0.76
136	C. D. Dubose	First Citizens Bank and Trust Co., Clinton	Br. of Coharie Cr.	0.76
139	C. D. Dubose	First Citizens Bank and Trust Co., Clinton	Br. of Big Swamp	0.76
422	J. M. Butler	Box 126, Roseboro	Bullards Br.	1.43
467	R. D. Johnson	R#1, Roseboro	Br. of Big Swamp	0.32
227	R. C. Owen	R#1, Roseboro	Br. of Big Swamp	0.62
230	J. K, Faircloth	R#1, Salemburg	Rice Swamp	0.67
423	Snow Hill Farm	Box 52, Roseboro	Bearskin Swamp	1.43
321	C. G. Williams	Godwin	Gum Branch	0.57
421	Martin Fram	Box 52, Roseboro	Butler Br.	1.43
51	G. W. Love	Garland	South River	1.57
420	Mrs. J.C. Butler	Box 52, Roseboro	Br. of South R.	1.43
257	Abel & C.W.Warren	Garland	Br. of South R.	0.48
388	Wilbert Pridgen	R#1, Harrells	Br. of South R.	0.15
364	Mrs.Eliz.T.Rickey	Box 314, Faison	Br. of Six Run Swp.	0.46
300	J. H. Ware	Turkey	Br. of Six Run Swp.	0.50
262	C.C. Robinson	Clinton	Gum Branch	0.50
160	D. L. Robbs	R#5, Clinton	Br. of Six Run Swp.	0.67
358	R. H. Phillips	R#1, Magnolia	Br. of Six Run Swp.	0.44
401	A. J. Snipes	R#1, Magnolia	Br. of Juniper Br.	0.46
484	J. A. Huring	R#1, Rose Hill	Boyette Cr.	1.99
325	David Sinclair	R#1, Rose Hill	Br. of Six Run Swp.	0.51
384	H. D. Merritt	R#1, Rose Hill	Boyette Creek.	0.69
717	W. O. Tysinger	R#1, Garland	Clear Run Swp.	0.34
318	H. I. Register	Clinton	Br. of Six Run Swp.	0.90
360	E. D. Smith and J. J. Stafford	R#4, Clinton	Mirey Br.	1.51
485	Jeivel Malpass	405 Cooper Dr.,Clinton	Br. of Gum Chimney Br.	0.44
455	D. P. Elmore	Eliz.St., Clinton	Oates Br.	0.38
527	L. W. Raynor	R#2, Clinton	Oates Br.	0.50

SAMPSON COUNTY (CONTINUED)

Permit Number	Name	Address	Source	Amount (c.f.s.)
563	C.E. Schneider	R#4, Clinton	Oates Br.	0.71
233	Ray Cannon	R#1, Garland	Br. of Black R.	0.36
544	A. H. Scronce	R#1, Tomahawk	Keith Swp. Br.	0.46
525	J. L. Thornton	R#1, Tomahawk	Br. of Black R.	0.42
524	C. S. Kerr	R#1, Harrells	Black River	0.57
540	John Moore	Ivanhoe	Black River	1.24
179	Mrs. J.C. Butler	Box 52, Roseboro	Highsmith Cr.	1.43
518	R. P. Johnson	R#1, Wallace	Highsmith Cr.	0.40
723	B. W. Carter	803 Raleigh Rd.,Clinton	Br. of Ten Mile Swp.	0.61
789	McRay Bradsher	R#1, Clinton	Br. of Six Runs Cr.	0.57

WAKE COUNTY

441	W. M. McLaurin	R#2, Fuquay Springs	Br. of Buckhorn Cr.	0.70
777	Charlie Jenkins	R#2, Apex	Br. of Whiteoak Cr.	0.20

WAYNE COUNTY

None

Records of wells used to supply water to industries - Bulletin 47, North Carolina Department of Conservation and Development, entitled "Progress Report on Ground Water in North Carolina by M. J. Mundorff," prepared in cooperation with the Geological Survey, United States Department of the Interior, and published in 1945, contains the following information regarding wells in the Cape Fear River Basin used for the purpose of supplying water to industries.

Alamance County

Altamahaw

Altamahaw Mill

Depth: 160 feet, diameter: 6 inches, location: valley, chief aquifer: schist, yield: 70 g.p.m., used for drinking, soaking, and humidifying.

Bellemont

Burlington Mill Corporation

Depth: 80 to 185 feet, diameter: 2 inches, location: valley, chief aquifer: schist, yield: 2 to 6 g.p.m., four wells, 80,85,90, and 185 feet deep.

Burlington

Pepsi Cola Plant

Depth: 162 feet, diameter: 6 inches, location: slope, yield: 84 g.p.m.

Cherokee Flooring Company

Depth: 200 feet, diameter: 6 inches, location: flat, chief aquifer: schist, yield: 15 g.p.m.

May Hosiery Mills

Depth: 634 feet, diameter: 10-8 inches, location: draw, chief aquifer: granite ?, yield: 300 g.p.m., hardness: 142 parts per million.

Celanese Lanese Corporation

Depth: 390 feet, diameter: 8 inches, location: draw, chief aquifer: granite, yield: 35 g.p.m.

Haw River

Tabardrey Manufacturing Company

Depth: 450 feet, diameter: 8 inches, location: slope, chief aquifer: schist, yield: 90 g.p.m., quartz veins near well.

Depth: 600 feet, diameter: 8 inches, location: slope, chief aquifer: schist, yield: 75 g.p.m., many quartz veins exposed near well.

Travora Manufacturing Company

Depth: 61 feet, diameter: 8 inches, location: flat, chief aquifer: schist, yield: 20 g.p.m.

Hopedale

Copeland Fabrics Corporation

Depth: 470 feet, diameter: 8 inches, location: valley, chief aquifer: granite, yield: 30? g.p.m., hardness: 138 parts per million

Mebane

Fitch-Riggs Lumber Company

Depth: 97 feet, diameter: 6 inches, location: flat, chief aquifer: schist, yield: 20 g.p.m., reported soft, no iron.

Ossippee

Ossippee Weaving Company

Depth: 335 feet, diameter: 10 inches, location: slope, chief aquifer:

schist, yield: 40 g.p.m., temperature: 60° F., hardness by field test: 120 parts per million.

Saxapahaw

Sellars Manufacturing Company

Depth: 160 and 204 feet, diameter: 8 inches, location: slope, chief aquifer: slate, yield: 30 g.p.m. average, two wells - used for drinking and humidifying.

Swepsonville

Virginia Mills Company

Depth: 408 feet, diameter: 8 inches, location: valley, chief aquifer: diorite?, yield: 20 g.p.m. ?, water level reported 265 feet below surface.

Chatham County

Merry Oaks

Royal Crown Company

Depth: 90 feet, diameter: 6 inches, chief aquifer: shale (Triassic), yield: 8 g.p.m.

Siler City

Siler City Hosiery Company

Depth: 700 feet, diameter: 8 inches, chief aquifer: slate, yield 1.5 g.p.m.

Guilford County

Friendship

Airport

Depth: 123 feet, diameter: 6 inches, location: hill, chief aquifer: schist, yield: 52 g.p.m., drawdown: 46 feet with 52 gallons a minute.

Friendship, 2 miles southeast of

Plantation Pipeline Company

Depth: 294 feet, diameter: 8 inches, location: slope, chief aquifer: schist, yield: 71 g.p.m., drawdown: 147 feet with 71 gallons a minute.

Shell Oil Terminal

Depth: 200 feet, diameter: 6 inches, location: slope, chief aquifer: schist, yield: 12 g.p.m.

Standard Oil Terminal

Depth: 143 feet, diameter: 8 inches, location: draw, chief aquifer: schist, yield: 20 g.p.m. Most of the water is obtained at the 90-feet depth.

Greensboro

Pomona Terra Cotta Company

Depth: 65 - 120 feet, diameter: 3 inches, location: slope, chief aquifer; schist, yield: 15 to 20 g.p.m., three wells.

Pomona Mills Company

Depth: 302 feet, diameter: 8 inches, location: flat, chief aquifer: schist, yield: 60 g.p.m., temperature: 60° F.

Mock, Judson Voehringer Company
Depth: 438 feet, diameter: 8 inches, location: slope, chief aquifer: schist, yield: 200 g.p.m., drawdown: 200 feet with 200 gallons a minute.

Vick Chemical Company
Depth: 203 feet, diameter: 8 inches, location: slope, chief aquifer: schist; yield: ?, good supply reported.

George C. Brown & Company
Depth: 120 feet, diameter: 6 inches, chief aquifer: schist, yield: 15 g.p.m.

Proximity Manufacturing Company

Whiteoak Mill
Depth: 322 feet, diameter: 8 inches?, location: valley, chief aquifer: schist, yield: 55 g.p.m.

Revolution Mill
Depth: 437 feet, diameter: 8 inches, location: valley, chief aquifer: schist, yield: 100 g.p.m., not in use at present.

Revolution Mill
Depth: 402 feet, diameter: 8 inches, location: valley, chief aquifer: schist, yield: 100 g.p.m.

Print Works
Depth: 100 feet, diameter: ?, location: valley, chief aquifer: schist, yield: 100 g.p.m., hardness 201 parts per million.

Hubbard Street
Depth: 274 feet, diameter: 8 inches, location; hollow, chief aquifer: granite ?, yield: 100 g.p.m., temperature: 61°F.

At Standpipe
Depth: 487 feet, diameter: 8 inches, location: slope, chief aquifer: granite ?, yield: 70 g.p.m., capped - not in use.

Revolution Mill
Depth: 80 feet, diameter: 8 inches, location: hill, chief aquifer: granite, yield: 5 g.p.m., not used.

Home Ice Plant
Depth: 200 feet, diameter: 6 inches, chief aquifer: granite, yield: 24 g.p.m.

Carolina By-Products Company
Depth: 521 feet, diameter: 8 inches, location: draw, chief aquifer: schist, yield: 100 g.p.m.
Depth: 299 feet, diameter: 8 inches, location: slope, chief aquifer: schist, yield: 13 g.p.m., temperature: 61°F.

American Agriculture Chemical Company
Depth: 433 feet, diameter: 8 inches, location: hill, chief aquifer: schist, yield: 35 g.p.m., originally yielded 75 g.p.m.

Gibsonville

Mineola Manufacturing Company
Depth: 200 to 500 feet, diameter: 6 to 10 inches, location: flat, chief aquifer: schist, yield: 40 g.p.m. average, four wells.

High Point

Adams Millis Corporation
Depth: 120 and 124 feet, diameter: 4 to 6 inches, location: valley chief aquifer: schist, yield: 50 and 75 feet, two wells.

Cloverdale Dye Plant
Depth: 750 feet, diameter: 6 inches, location: hill, chief aquifer: slate, yield: 5 g.p.m., yields of 20 g.p.m. at 60 feet shut out.

Highlands Cotton Mills, Inc.
Depth: 190 feet, diameter: 6 inches, location: slope, chief aquifer: slate ?, yield: 12 g.p.m., most of water is obtained from above 100 feet.

Cloverbrand Creamery
Depth: 96 feet, diameter: 6 inches, location: flat, chief aquifer: schist, yield: 13 g.p.m.

Crown Hosiery Mill
Depth: 240 feet, diameter: 8 inches, location: flat, chief aquifer: schist, yield: 200 g.p.m., pumped at 125 g.p.m.

Logan Porter Mirror Company
Depth: 75 feet, diameter: 6 inches, location: flat, chief aquifer: schist, yield: 100 g.p.m., temperature: 62°F, hardness: 111 parts per million.

Montgomery County

Biscoe

Aileen Cotton Mills
Depth: 300 feet, diameter: 8 inches, chief aquifer: slate, yield: 30 g.p.m., cased 59 feet.
Depth: 400 feet, diameter: 8 inches, chief aquifer: slate, yield: 22 g.p.m., casing used.

Moore County

Carthage

Carthage Weaving Company
Depth: 123 feet, diameter: 4 inches, chief aquifer: Triassic, yield: 8 g.p.m.

Hemp

Standard Mineral Company
Depth: 178 feet, diameter: 8 inches, chief aquifer: talc?, yield 0.5 g.p.m.

Pinehurst Silk Mills
Depth: 203 feet, diameter: 6 inches, chief aquifer: slate, yield 30 g.p.m.

West End

Sandhill Furniture Company
Depth: 175 feet, diameter: 6 inches, chief aquifer: Triassic, yield: 15 g.p.m.

Randolph County

Franklinville

Randolph Mills, Inc.
Depth: 109 feet, diameter: 6 inches, chief aquifer: dike (diabase?), Yield: 3 g.p.m., rock, very hard.

Bulletin No. 55, entitled "Geology and Ground Water in the Greensboro Area, North Carolina, by M. J. Mundorff", published by the North Carolina Department of Conservation and Development in 1948, and prepared in cooperation with the Geological Survey, United States Department of the Interior, contains information additional to that shown above, regarding wells in Alamance and Guilford Counties, used for the purpose of supplying water to industries.

Alamance County

Mebane

Mebane Yarn Mills, Inc.

Depth: 185 feet, diameter: 6 inches, location: flat, chief aquifer: schist, yield: 25 g.p.m., water reported soft, free from iron.

Glencoe, 3 miles north of Burlington

Carolina Mills

Depth: 108 feet, diameter: 2 inches, location: slope, chief aquifer: granite, yield 7 + g.p.m., hard water reported, no iron.

Depth: 190 feet, diameter: 2 inches, location: slope, chief aquifer: granite, yield 7 g.p.m.

Burlington

Burlington Mills, Plaid Mill

Depth, ? feet, diameter 8? inches, location: flat, chief aquifer: granite, yield: 10? g.p.m.

Burlington, 1.5 miles northwest of

Pure Oil Plant

Depth: 73 feet, diameter: 6 inches, location: flat, chief aquifer: greenstone, yield: 25 g.p.m.

Burlington, 2 miles northwest of

Glen Raven Mill

Depth: 81 feet, diameter: 6 inches, location: hill, chief aquifer: greenstone, yield: 10 g.p.m.

Guilford County

Summerfield

L. A. Stafford (Hammer Mill)

Depth: 100 feet, diameter: 3 inches, location: draw, chief aquifer: granite, yield: 10 g.p.m.

Busick, 0.5 mile south of

Southern Webbing Mills

Depth: 185 feet, diameter: 8 inches, location: valley, chief aquifer: greenstone, yield: 40 g.p.m.

Greensboro, 4 miles west of

Pomona Terra Cotta Company

No. 2 Plant - Depth: 120 feet, diameter: 3 inches, location: slope, chief aquifer: greenstone, yield: 18 g.p.m.

No. 4 Plant - depth: 120 feet: diameter: 3 inches, location: slope, chief aquifer: greenstone, yield: 20 g.p.m.

Greensboro

Southern Railway Co. Roundhouse

Depth: 300 feet, diameter: 6 inches, location: flat, chief aquifer: greenstone, very large yield reported.

Buffalo Rock, Inc.

Depth: 126.5 feet, diameter: 6 inches, location: flat, chief aquifer: greenstone, satisfactory yield, soft water.

Piedmont Ice & Coal Company

Depth: 187 feet, diameter: 8 inches, location: flat, chief aquifer: granite, yield: 4 g.p.m.

Gibsonville

Mineola Manufacturing Company

Depth: 557 feet, diameter: 8 inches, location: draw, chief aquifer: greenstone, yield: 65 g.p.m., pumping level reported to be 90 feet below surface.

Depth: 436 feet, diameter: 10 inches, location: flat, chief aquifer: greenstone, yield 50 g.p.m., water reported to be coming from 200 feet, temperature: 63°F.

Greensboro, 4 miles southeast of

Neese Country Sausage Company

Depth: 48 feet, diameter: 6 inches, location: slope, chief aquifer: greenstone, yield: 12 g.p.m.

High Point

Colonial Stores, Inc.

Depth: 68 feet, diameter: 4 inches, location: flat, chief aquifer: greenstone, yield: 15 g.p.m., drawdown reported negligible.

Slane Hosiery Mill

Depth: 160 feet, diameter: 6 inches, location: slope, chief aquifer: greenstone, yield: 120 g.p.m., water from quartz begins at 90 and 120 feet, drawdown: 3 feet at 120 g.p.m.

Oakdale

Oakdale Cotton Mills

4 wells, depth: 30 to 100 feet, diameter: 3 drilled - 2", 1 dug - - 24" location: 1 - - valley, 3 - - slope, chief aquifer: granite, yield: 10 g.p.m. average.

Pleasant Garden

Robbins Mill Works

Depth: 120 feet, diameter: 2 inches, chief aquifer: greenstone, yield: 5 - 6 g.p.m.

Climax

Climax Corporation

Depth: 120 feet, diameter: 3 inches, chief aquifer: slate, yield: 15 g.p.m.

Drainage Basin Study by the National Resources Committee in cooperation with the Works Progress Administration - This study of river basins in District III, comprising the States of Maryland, Virginia, North Carolina, and South Carolina, was published in 1936 and contains the following information regarding water power in the Cape Fear River Basin.

Because of the fact that few sites exist on streams in the Cape Fear River Basin where considerable storage might be made available for water-power development, most of the larger, developed water-power plants are located on the more adaptable streams west of this basin, which have more constant flow, larger heads, and more available storage at reservoir sites.

There are, however, three hydroelectric power-developments, two on the Deep River and one on the Cape Fear River, having an installed capacity of 6500 h.p. All of these plants are owned by the Carolina Power and Light Company. In addition to these, there are scattered throughout the basin five steam-power plants. A list of power plants in the basin, showing ownership and installed capacity, is given below:

Hydroelectric Power Plants

Owner	Location	Installed Capacity (h.p.)
Carolina Power & Light Co.	Carbonton	1,350
Carolina Power & Light Co.	Lockville	1,350
Carolina Power & Light Co.	Buckhorn Falls	3,800
	Total -	6,500

Steam Power Plants

Carolina Power & Light Co.	Cape Fear	40,000
Durham Public Service Co.	Durham	3,350
Duke Power Company	Greensboro	10,000
Tide Water Power Co.	Wilmington	15,000
Tide Water Power Co.	Morehead City	1,400
	Total -	69,750

(Note: Morehead City is in the Newport River Basin. This basin and the White Oak and New River Basins were included by the National Resources Committee in the study of the Cape Fear River Basin. Durham is on the divide between the Cape Fear River Basin and the Neuse River Basin.)

There are also 36 smaller water-power developments having a total installed capacity of 15,957 h.p. These latter plants are, for the most part, located on the Piedmont Plateau tributaries of the Cape Fear River, and they are owned by, and supply power for, local textile mills, manufacturing industries, etc.

The City of High Point owns a reservoir, which impounds about 4,200 acre-feet of water, located on the Deep River near Jamestown. The dam is about 30 feet high, and the drainage area at this point is approximately 55 square miles. No power is developed at this site, the water being impounded for municipal purposes. However, provision has been made in the dam for the installation of a hydroelectric plant if it is ever needed.

It has been estimated that the annual amount of power, used in this area in 1929, was approximately 612,000,000 kilowatt-hours. In general, this power is supplied by the Tide Water Power Company in the southern part of the basin, by the Carolina Power and Light Company in the central portion, and by the Duke Power Company in the northern area of the basin. These companies own and operate numerous hydroelectric and steam plants and are connected by a vast transmission system to other large power interests of the State, by means of which they interchange and market power. From a study of past trends of kilowatt-hours generated and consumed during the period of 1920-1931, the present installed capacity will be capable of supplying the demand for power until 1946. This estimate has been made by the Army Engineers, assuming that the probable increase in production in the next 20 years will be approximately equal to the production of 1926 compounded at 6% annually, and that the average capacity factor of the plants serving this area is 45%.

The Army Engineers have made extensive investigations of water-power development in the Cape Fear River Basin and have set forth a proposed comprehensive scheme of power development in their report on this basin, House Document Number 193, 73rd Congress, 2nd Session.

House Document No. 193, 73rd Congress, 2nd Session - This publication includes the reports of the District Engineer, the Division Engineer, the Board of Engineers for Rivers and Harbors, and the Chief of Engineers and contains the following information regarding development of water power in the Cape Fear River Basin. The report of the Chief of Engineers was submitted to the Secretary of War for transmission to Congress on September 26, 1933.

Previous reports on water power - In 1899, the North Carolina Geological Survey, predecessor of the North Carolina Department of Conservation and Development, issued a bulletin entitled "Water power in North Carolina". Chapter VII in this bulletin treats of the water power on the Cape Fear River and its tributaries. Contained therein is a description of the streams, their potential water power, the rainfall of the area, and a description of the plants in operation at that time. Similar data are also contained in "Water Supply Paper No. 83", and a brief mention of the power on this stream is made in several other publications of the United States Geological Survey. In 1923, the North Carolina Geological and Economic Survey prepared a report known as "Economic Paper No. 4" entitled "Water Power Investigation of Deep River". This paper contains much valuable data on the hydrology of the Deep and Cape Fear Rivers, and outlines a plan for the intensive development of the former stream, embodying the construction of a series of reservoirs and power dams which would be possibly supplemented by a "mouth of mine" stream plant, the whole to be interconnected by a transmission system. Except for these, no reports, which directly concern the water power of this area, were discovered.

Factors influencing the development of water power - As shown by their discharge records, the streams in the Cape Fear River Basin are subject to long periods of low flow and frequently to floods during wet periods. Both of these features have hampered their development for power purposes.

Also, these streams were among the first in North Carolina on which water power was developed. Most of the better natural-sites have been occupied for many years. These sites were independently developed in a manner to suit the purpose of the individual developer, a condition which has hindered the further use of the streams for power purposes.

Although many fine natural power sites are found on the tributaries of

the Cape Fear River, their valleys in general are narrow and, therefore, few sites exist where considerable storage might be made available. On the main stream, the few natural sites capable of development require expensive dams and appurtenances, and similar amounts of power could be developed much more economically on other streams in the State.

Existing developments - At present, these is but one water-power development of any significanace in the Cape Fear River area. This is a hydroelectric development, owned by the Carolina Power & Light Company, at Buckhorn Falls in Chatham County on the main stream. The installed capacity of this plant is 2,900 kilowatts. The tributary drainage area above this plant is about 3,280 square miles, and the head developed is about 19 feet.

The only other development worthy of description is the reservoir belonging to the City of High Point located on the Deep River near Jamestown. The dam is immediately below the junction of the two forks on this stream. It is about 50 feet high and impounds about 4,200 acre-feet of water. The drainage area at this point is approximately 55 square miles. No power is developed at this site, the water being impounded for municipal purposes.

There are many small power-developments on the tributaries of the Cape Fear River. The principal ones have been listed in the following tables which are not intended to be entirely inclusive. Most of these plants are more or less out-of-date and are not so located as to develop the streams to the best advantage. The tables may be slightly in error in some details as the data contained therein were obtained from several sources, but checks made by field parties showed the information to be substantially correct.

Table I --Water-power developments on Deep River

Name of plant	Location	County	Drainage area, sq.mi.	Installed Capacity Kilowatts	Purpose
Oakdale Cotton Mills	Oakdale	Guilford	69	430	Textile manufacturing
Chilton Mills	Chilton	do.	92	19	Grist mill
Coltrane Mill	Coltrane Mill	Randolph	124	22	do.
Walkers Mill	Walkers Mill	do.	160	20	do.
Deep River Mills No. 1	Randleman	do.	170	240	Textile manufacturing
Deep River Mills No. 2	do.	do.	170	240	do.
Leward Cotton Mills	Worthville	do.	223	300	do.
Cox Power Plant	Above Cedar Falls	do.	250	300	Not in use
Sapona Cotton Mills No. 1	Cedar Falls	do.	257	138	Textile manufacturing
Sapona Cotton Mills No. 2	do.	do.	260	56	do.
Randolph Mills No. 1	Franklinville	do.	278	185	do.
Randolph Mills No. 2	do.	do.	278	144	do.

Table I --Water-power developements on Deep River (continued)

Name of plant	Location	County	Drainage area sq. mi.	Installed Capacity Kilowatts	Purpose
Columbia Manufacturing Co.	Ramseur	Randolph	343	358	Textile manufacturing
Enterprise Manufacturing Co.	Coleridge	do.	391	207	do.
Howards Mill	Howards Mill	Moore	575	22	Grist mill
High Falls Mfg.Co.	High Falls	do.	748	186	Textile Manufacturing
Carolina Power & Light Co.	Carbonton	Lee	970	1,000	Electric power
Carolina Power & Light Co.	Lockville	Chatham	1,380	1,000	do.

Table 2 — Water-power developments on Haw River

Altamahaw Cotton Mill	Elon College	Alamance	226	145	Textile manufacturing
Latonia Power Plant	Burlington	do.	475	200	do.
Glencoe Mill	do.	do.	495	150	do.
Carolina Cotton Mill	do.	do.	500	75	do.
Hopedale Mill	do.	do.	600	150	do.
Holt Granite Mfg. Co.	Haw River	do.	610	373	do.
Virginia Cotton Mill	Swepsonville	do.	700	485	do.
Va. Power Plant	do.	do.	960	450	do.
Saxapahaw Cotton Mill	Saxapahaw	do.	1,020	850	do.
Paces Mill	Bynum	Chatham	1,270	15	Cotton gin
Chatham Roller Mill	do.	do.	1,290	30	Roller, grist, gin
J.M. O'Dell Mfg. Co.	do.	do.	1,290	187	Textile manufacturing
C.P.& L. Co.	Moores Mill	do.	1,350	15	do.

Table 3 Water-power developments on Lower Little River

C.P.& L. Co.	Lobelia	Hoke	110	400	Electric power
C.P.& L. Co.	Lower plant	do.	230	450	do.

Table 4 - Water-power developments on Rockfish and Little Rockfish Creeks

Hope Mills No. 2	Hope Mills	Cumberland	200	260	Textile manufacturing
Raeford P.&M.Co.	do.	do.	185	373	do.
Hope Mills No. 1	do.	do.	110	183	do.
Hope Mills No. 3	do.	do.	110	75	do.

Proposed power developments - The proposed plan embodies the construction of four projects on Haw River and one on the main stream. No undeveloped suitable sites for the economical production of appreciable amounts of power on other streams of the basin were discovered. The sites on Haw River are New Hope at the confluence of Haw and New Hope Rivers, Moores Mill, Bynum, and Mandale. The site on the Cape

Fear River is Smiley Falls near Lillington. The following table contains a summary of the most important features of the proposed developments in downstream order.

Table 5

Project	River	Drainage area sq. mi.	Max. pool elevation, ft. above m.s.l.	Tail water elevation	Length of dam crest, feet	Area of pool, acres	Total capacity of pool, acre-ft.
Mandale	Haw	1,170	470	390	2,830	8,000	237,000
Bynum	do.	1,290	390	300	2,100	3,200	88,000
Moores Mill	do.	1,350	300	230	1,140	500	8,700
New Hope	do.	1,740	230	160	1,000	22,000	413,000
Smiley Falls	Cape Fear	3,700	100	60	640	500	7,900

The following table summarizes the amount of primary power available in the proposed plan of development.

Table 6

Project	Max. draw-down, feet	Usable storage, acre-feet	Primary flow, second-feet	Minimum operating head, ft.	Primary capacity Kilowatts	Annual primary output, Kilowatt-hrs.
Mandale	26	153,000	600	54	4,000	20,600,000
Bynum	10	30,000	670	80	5,100	34,000,000
Moores Mill			670	68	4,000	28,800,000
New Hope	8	160,000	1,030	62	6,100	40,300,000
Smiley Falls			1,225	38.5	4,100	30,300,000
Total		343,000		302.5	23,300	154,000,000

The amount of secondary power (the energy output of hydroelectric plants in excess of primary power), which could be produced by the proposed plants, is shown in the following table.

Table 7

Project	Proposed plant capacity, Kilowatts	Annual secondary power available, Kilowatt-hours
Mandale	22,400	33,800,000
Bynum	29,600	31,000,000
Moores Mill	22,400	27,200,000
New Hope	33,500	35,700,000
Smiley Falls	23,800	53,900,000
Total	131,700	181,600,000

Table 8

The estimated costs of the projects are as follows:

Mandale	$5,782,465
Bynum	4,983,760
Moores Mill	2,957,240
New Hope	7,563,045
Smiley Falls	2,558,400
Total	$23,844,910

The annual cost of operation and maintenance of the proposed plants has been assumed as $1.50 per Kilowatt of installed capacity. Other annual charges for the proposed projects would be in percent of the capital cost approximately as shown below.

Interest at 6 percent	$1,430,700
Depreciation at 1 percent	238,450
Taxes and insurance at 2 percent	476,900
Administration and overhead at 1 percent	238,450
Operation and maintenance at $1.50 per Kilowatt	197,550
Total annual charges	$2,572,050

Value of power produced at proposed plants— In general, the value of power produced by hydroelectric plants may be taken as equal to the cost of producing the same power by steam generation. The cost of producing power by a steam plant depends upon the load factor at which the power is produced. . .

The system load factor, at which primary power would be produced, is about 17.8 percent. It has been determined that power produced at this load factor would be worth about $0.01336 per Kilowatt-hour. The proposed plants would produce 154,000,000 Kilowatt-hours of this power annually (see Table 6 above) which, at the above rate, would have a value of $2,057,440.

The secondary power, which would be produced by the proposed hydroelectric plants, would only serve the purpose of saving coal consumption as the annual charges, involved in power production at steam plants, remain practically constant no matter what the output. Based on the figures given above, it would cost a steam plant approximately $0.0027 per kilowatt-hour to produce this type of power.

Practically all of the secondary power, which would be produced by the proposed hydroelectric plants, would be salable. During times of large stream-flow when secondary power was being produced, the proposed hydroelectric plants would be operated as base-load plants, the power required in the peaks of the hourly load curve being filled in by steam generation. All the existing hydroelectric plants in this area are of low head and are out of operation due to head loss when stream flow is large and, hence, they need not be considered in determining the salability of secondary power. The installed capacities of the proposed plants total 131,700 kilowatts (see Table 7 above) and, at certain periods, water would be available in sufficient quantities for the production of power at that rate. During a portion of the time, power would not be demanded at as high a rate as the above. However, from a study of the operation tables, it has been determined that, except in cases where the stream flow is large, there is no waste of water. Hence, the estimated output of 181,600,000 kilowatt hours (see Table 7 above) of secondary power would be salable. The value of this power at the above rate ($0.0027 per kilowatt-hour) would be $490,320.

Value of proposed power system to existing plants - In addition to the value of power produced at the proposed projects, the regulation of stream flow would make available additional power at the Buckhorn Falls plant of the Carolina Power & Light Company. The value of the power produced has been assumed as $0.0052 per kilowatt-hour for primary power and $0.0027 per kilowatt-hour for secondary power. This primary-power value is the cost of producing such

power by a steam plant operating at approximately 75-percent load factor. The above figures are estimates for use in this report only and are, of course, subject to more accurate determinations and revisions by regulating agencies. It has been determined that the annual increase in value of the power available at the existing plant (Buckhorn Falls) would be $43,525.

Effect of proposed power plan on flood stages below - The effect of the proposed power-reservoirs on floods would depend on whether they were empty or full at the time of occurrence of the floods. If drawn down or partially so, the reservoirs would have a tendency to reduce flood heights. However, if full, these reservoirs would eliminate a large part of the stream valley which was formerly available for the storage of flood water. The elevation of the water surface of most of the reservoirs proposed is to be controlled by spillway-crest gates so operated as to maintain a nearly constant pool elevation at the dam site during periods of large discharge. Hence, the only reservoir-storage available to compensate for the reduction in valley storage would be surcharge due to the slope of the water necessary to cause the flood waters to move through the reservoir. In some cases, this surcharge-storage would doubtless be equal to or greater than the amount of valley storage eliminated. In other cases, it would be less. In order to make a definite statement of the effect of the proposed power-projects on floods, it would be necessary to make a long-period investigation covering various types of floods and with the reservoirs either full or drawn down as the case might be. There is but small chance of the effects being sufficient to determine the economic justification of the projects. Hence, such an investigation has not been deemed necessary for this report. It is believed advisable to consider this feature in more detail, however, before actual construction of these projects.

Summary of value of the proposed power projects - The regulatory effects of the reservoirs on stream flow would be of little benefit to the municipalities or industries of the region, as sufficient low-water flow already exists to meet their requirements for some years to come. Navigation on this stream can only be caused by canalization and, as there is ample water for lockage purposes, the proposed regulation would be of little value to navigation. It has been shown that the plan would have no appreciable beneficial effect on flood stages. The annual value of the plan may be summarized as consisting of the value of the primary and secondary power produced at the proposed plants and the increase in value of the power available at one existing plant. A summary of these items is shown below.

Value of primary-power output in proposed plants	$2,057,440
Value of secondary-power output in proposed plants	490,320
Increase in value of power available at existing plant	43,525
Total annual value of the proposed power projects	$2,591,285

Conclusions regarding the plan of development - The proposed plan of development might possibly be economically justified if and when a good market develops. Competition from sources outside the Cape Fear River Basin may be eliminated, because all of the plants in the plan are designed to meet the demands for power at low-load factor, and the cost of transmitting such power for long distances is relatively high. The proposed plan is well adapted for development by parts and can be gradually built up as the market for power develops. If any of the projects are to be installed, their effects on the flood heights of the stream below should be given careful consideration.

Recreation and Wildlife - There are five lakes in the Cape Fear River

Basin, owned by the State, in which swimming, boating, and fishing are enjoyed. These lakes - Black, Jones, Salters, Singletary, and White - are located in Bladen County and cover a total area of approximately 4,700 acres.

Two of these lakes were developed by the Resettlement Administration for recreational purposes in connection with its Land Use Project LD - NC - 4, which was located at Elizabethtown, Bladen County. The project included development of approximately 40,000 acres for recreation and forestry purposes. Reforestation was performed on 16,000 acres, and approximately 42 miles of truck trails were constructed. Cabins, bath houses, and recreational buildings were constructed for recreational purposes in connection with this project.

The State-owned Frank Stedman Fish Hatchery and Game Farm is located on Lake Rim about halfway between Fayetteville, Cumberland County, and Raeford, Hoke County. There are several State game refuges in the Cape Fear River Basin, the largest being located in Pender County. Recreational facilities for military service personnel have been developed on the Fort Bragg Military Reservation, lying in both Cumberland and Hoke Counties and comprising the largest military reservation in the United States.

Jones Lake State Park - This park is located on State Highway 242 in Bladen County, four miles from Elizabethtown. It covers 1,000 acres and is operated exclusively for Negro use. The area contains typical Coastal Plain forest-landscape and good examples of pocosins, which are upland swamps peculiar to the eastern parts of North Carolina, South Carolina, and Georgia. Jones Lake, one of the natural lakes said to have been formed by the impact of meteorites on the earth's surface, has an area of 230 acres and is the most important natural-features. With its placid surface and cypress-bordered shores, it forms a beautiful landscape-picture.

The park contains a great variety of trees and shrubs. The most conspicuous tree is the stately long-leaf pine with its distinctive, long needles. Other trees include loblolly pine, pond pine which grows in the pocosins, juniper (white cedar), gum, American holly, and turkey oak. Distinctive shrubs include the loblolly or bull bay with its beautiful, white flowers and pungent leaves, wax myrtle, gallberry, and fetter bush with flowers like those of the lily-of-the-valley.

Animals include deer, fox, squirrel, and muskrat. Turkeys, redwing blackbirds, owls, hawks, and numerous song-birds are included among the birds.

Jones Lake State Park is within the boundaries of 40,000-acre Bladen Lakes State Park, originally developed by the Resettlement Administration. A paved park-road system leads to all developed areas, and a parking area is located near the bathhouse and picnic area. Swimming facilities include a bathhouse, sand beach, and protected water-area. Boating facilities include a boathouse and boats for rent. Bass and panfish are caught in the lake. The picnic area is equipped with picnic shelter, tables, benches, outdoor fireplaces, water, and toilets. Other facilities include a refreshment stand and a tent-and-trailer campground with individual camp-sites, central washhouse, and toilets.

Stream Flow Records - Mean monthly, maximum daily, minimum daily, and mean weekly discharges, all in million gallons per day, at 20 gaging stations in the Cape Fear River Basin, may be found in "Hydrologic Data on the Cape Fear River Basin, 1820-1945", published in 1947 by the North Carolina Department of Conservation and Development and prepared in cooperation with the Geological Survey, U. S. Department of the Interior. Stream-flow data for years subsequent to 1945, at these gaging stations, are shown below.

Bear Creek at Robbins, Moore County

Location - - Water-stage recorder, just downstream from Cabin Creek and 0.5 mile west of Robbins.

Drainage area - - 134 square miles.

Records available - - November 1939 to date.

November 1939 to December 1945

Average discharge - - 83.2 m.g.d.
Extreme maximum discharge - - 17,400 m.g.d. Sept. 18, 1945 (gage height - 32.02 ft.)
Extreme minimum discharge - no flow Oct. 2, 22-27, 1941 (gage height - 1.98 ft.)

Remarks - - Some diurnal fluctuation caused by mills above station. Records include a small diversion by Town of Robbins for its municipal water supply.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	479	505	866	506	374	352	859	477
Minimum mean weekly discharge (m.g.d.)	20	6.4	5.2	14	12	2.64	3.8	2.74
Maximum mean weekly discharge (c.f.s.)	742	781	1340	783	579	545	1330	739
Minimum mean weekly discharge (c.f.s.)	31	9.9	8.0	21	19	4.09	5.9	4.24
Maximum daily discharge (m.g.d.)	1740	2020	2060	2250	1780	1240	4590	1930
Maximum daily discharge (c.f.s.)	2700	3120	3190	3480	2760	1920	7100	2990
Mean daily discharge (m.g.d.)	125	82.7	138	110	85.3	53.1	125	85.9
Mean daily discharge (c.f.s.)	194	128	214	170	132	82.2	193	133
Minimum daily discharge (m.g.d.)	17	2.58	3.88	3.88	11	1.62	3.04	2.13
Minimum daily discharge (c.f.s.)	27	4	6	6	17	2.5	4.7	3.3

Cape Fear River at Lillington, Harnett County

Location - - Water-stage recorder, at highway bridge just downstream from Norfolk Southern Railway bridge at Lillington, and one mile downstream from Neill Creek.

Drainage area - - 3,440 square miles.

Records available - - December 1923 to date.

December 1923 to December 1945
Average discharge - 2,149 m.g.d.
Maximum discharge - 124,000 m.g.d. Sept. 19, 1945 (gage height - 33.19 ft.)
Minimum discharge - 19 (regulated) m.g.d. Oct. 8, 1926 (gage height - 0.01 ft.)

Remarks - Large diurnal fluctuation and considerable regulation for short periods at low flow caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	10500	13800	17700	11100	8140	7930	18000	11300
Minimum mean weekly discharge (m.g.d.)	401	198	102	442	186	48	178	58
Maximum mean weekly discharge (c.f.s.)	16200	21300	27400	17200	12600	11500	27800	17500
Minimum mean weekly discharge (c.f.s.)	620	307	158	684	288	74	376	90
Maximum daily discharge (m.g.d.)	31600	22200	30400	24200	18500	20900	46200	26400
Maximum daily discharge (c.f.s.)	48900	34400	47000	37400	28600	32400	71500	40900
Mean daily discharge (m.g.d.)	2430	2002	2985	2594	1482	1072	2704	2041
Mean daily discharge (c.f.s.)	3760	3099	4620	4016	2294	1660	4186	3159
Minimum daily discharge (m.g.d.)	187	83	39	80	104	36	109	39
Minimum daily discharge (c.f.s.)	290	129	60	124	161	55	168	61

Cape Fear River at Lock No. 3, near Tarheel, Bladen County

Location - - Water-stage recorder, 100 feet above concrete dam and lock, 1 mile downstream from Bladen-Cumberland County Line, and 7 miles north of Tarheel.

Drainage area - - 4,810 square miles.

Records available - - October 1937 to date.

October 1937 to December 1945
Average discharge - - 3,050 m.g.d.
Extreme maximum discharge - - not determined.
Extreme minimum discharge - - 129 m.g.d. (regulated) Oct. 20, 1940 (gage height - - 0.42 foot).

Remarks - - Slight diurnal fluctuation and some regulation for short periods at low flow caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	17100	16400	22700	13800	8790	16300	25400	12700
Minimum mean weekly discharge (m.g.d.)	840	620	479	943	488	275	423	240
Maximum mean weekly discharge (c.f.s.)	26500	25400	35200	21300	13600	15900	39300	19700
Minimum mean weekly discharge (c.f.s.)	1300	960	742	1460	755	426	655	372

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum daily discharge (m.g.d.)	29100	23500	32300	23900	16800	19600	44200	24500
Maximum daily discharge (c.f.s.)	45000	36400	50000	37000	26000	30400	68400	38000
Mean daily discharge (m.g.d.)	3684	3137	4393	3884	2238	1558	3694	2952
Mean daily discharge (c.f.s.)	5703	4856	6801	6012	3465	2411	5719	3470
Minimum daily discharge (m.g.d.)	579	403	326	520	355	195	304	178
Minimum daily discharge (c.f.s.)	896	624	505	805	550	302	471	275

Deep River at Moncure, Chatham County

Location - - Water-stage recorder, 1½ miles northwest of Moncure.

Drainage area - - 1,410 square miles.

Records available - - May 1898 to December 1899 (fragmentary), July 1930 to date.

July 1930 to December 1945
Average discharge - - 887 m.g.d.
Extreme maximum discharge - - 51,870 m.g.d. Sept. 18, 1945 (gage height - 17.20 feet)
Extreme minimum discharge - - 6.1 m.g.d. Nov. 11, 1941.

Remarks - - Diurnal fluctuation and considerable regulation for short periods caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	4330	6520	8270	4010	4520	3130	8460	5360
Minimum mean weekly discharge (m.g.d.)	162	57	45	133	79	20	88	27
Maximum mean weekly discharge (c.f.s.)	6700	10100	12800	6210	7000	4840	13100	8290
Minimum mean weekly discharge (c.f.s.)	251	88	70	206	123	31	136	42
Maximum daily discharge (m.g.d.)	12000	10200	14300	9560	1110	8010	21800	10500
Maximum daily discharge (c.f.s.)	18500	15800	22200	14800	17200	12400	33800	16200
Mean daily discharge (m.g.d.)	1161	823	1357	1108	698	467	1222	933
Mean daily discharge (c.f.s.)	1797	1274	2100	1715	1080	723	1891	1445
Minimum daily discharge (m.g.d.)	67	34	41	54	43	12	45	25
Minimum daily discharge (c.f.s.)	103	52	64	84	66	19	70	39

Deep River at Ramseur, Randolph County

Location - - Water-stage recorder, 200 feet downstream from railroad station at Ramseur and 1.5 miles downstream from Sandy Creek.

Drainage area - - 346 square miles.

Records available - - November 1922 to date.

November 1922 to December 1945

Average discharge - - 228 m.g.d.
Extreme maximum discharge - 27,800 m.g.d. Sept. 18, 1945 (gage height - 34.04 ft.)
Extreme minimum discharge - - 0.26 m.g.d. (regulated) May 27, Nov. 28, 29, 1941 (gage-height - 0.27 foot).

Remarks - - Flow slightly regulated by High Point Reservoir and small power-plant reservoirs.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	1670	1720	1600	1450	605	1160	1910	1290
Minimum mean weekly discharge (m.g.d.)	38	8.4	23	37	14	7.8	26	8.4
Maximum mean weekly discharge (c.f.s.)	2590	2670	2480	2250	936	1800	2950	2000
Minimum mean weekly discharge (c.f.s.)	59	13	35	58	21	12	41	13
Maximum daily discharge (m.g.d.)	5340	9300	5100	4080	2290	4810	10900	4350
Maximum daily discharge (c.f.s.)	8260	14400	7900	6320	3550	7440	16900	6730
Mean daily discharge (m.g.d.)	224	209	285	270	129	128	273	208
Mean daily discharge (c.f.s.)	347	324	441	418	200	198	423	322
Minimum daily discharge (m.g.d.)	9.0	8.4	4.78	6.5	7.1	2.39	11	4.39
Minimum daily discharge (c.f.s.)	19	13	7.4	10	11	3.7	17	6.8

Deep River near Randleman, Randolph County

Location - - Water-stage recorder, 500 feet downstream from county bridge at Coltrane's mill, 0.5 mile south of Guilford-Randolph County Line, and 7 miles north of Randleman.

Drainage area - - 124 square miles.

Records available - October 1928 to date.

October 1928 to December 1945

Average discharge - 77.7 m.g.d.
Extreme maximum discharge - 6160 m.g.d. Sept. 18, 1945 (gage height - 25.18 ft.).
Extreme minimum discharge - - 0.32 m.g.d. (regulated) Nov. 28, 1931 (gage height 1.41 feet).

Remarks - Large diurnal fluctuation at low flow caused by Coltrane's mill. Flow slightly regulated by High Point Reservoir.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	590	1400	592	616	174	443	603	474
Minimum mean weekly discharge (m.g.d.)	11	8.4	9.0	15	12	4.65	10	6.5

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (c.f.s.)	913	2170	917	954	270	685	934	733
Minimum mean weekly discharge (c.f.s.)	17	13	14	23	18	7.2	15	10
Maximum daily discharge (m.g.d.)	2150	7750	1550	2290	590	2240	3210	2150
Maximum daily discharge (c.f.s.)	3330	12000	2400	3540	913	3470	4970	3330
Mean daily discharge (m.g.d.)	64.1	85.9	93.0	103	45.7	45.7	93.7	74.3
Mean daily discharge (c.f.s.)	99.3	133	144	159	70.8	70.7	145	115
Minimum daily discharge (m.g.d.)	7.8	1.55	4.65	7.8	6.5	1.81	1.23	1.81
Minimum daily discharge (c.f.s.)	12	2.4	7.2	12	10	2.8	1.9	2.8

East Fork Deep River near High Point, Guilford County

Location - - Water-stage recorder at highway bridge 0.25 mile upstream from High Point Reservoir and 6 miles northeast of High Point.

Drainage area - - 14.2 square miles.

Records available - - July 1928 to date.

July 1928 to December 1945
Average discharge - - 9.74 m.g.d.
Extreme maximum discharge - 2290 m.g.d. June 8, 1934 (gage height - 7.5 feet) from rating curve extended above 1000 m.g.d., by contracted-opening computation at gage height 10.87 feet.
Extreme minimum discharge - 0.45 m.g.d. Sept. 28, 1941 (gage height - 0.18 foot).

Remarks - Records good.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	84	191	61	84	157	51	81	50
Minimum mean weekly discharge (m.g.d.)	2.63	1.87	2.34	3.06	2.54	1.67	2.05	1.65
Maximum mean weekly discharge (c.f.s.)	130	296	94	130	243	79	125	78
Minimum mean weekly discharge (c.f.s.)	4.07	2.90	3.63	4.73	3.93	2.59	3.17	2.56
Maximum daily discharge (m.g.d.)	501	1080	253	293	103	247	378	256
Maximum daily discharge (c.f.s.)	775	1670	391	454	160	383	585	397
Mean daily discharge (m.g.d.)	9.43	11.3	10.9	12.6	5.96	6.65	11.8	9.82
Mean daily discharge (c.f.s.)	14.6	17.5	16.8	19.5	8.23	10.3	18.2	15.2
Minimum daily discharge (m.g.d.)	2.52	1.68	2.20	2.65	2.5	1.6	1.87	1.55
Minimum daily discharge (c.f.s.)	3.9	2.6	3.4	4.1	3.8	2.4	2.9	2.4

Haw River near Benaja, Rockingham County

Location - - Water-stage recorder at site of old High Rock Mill, 500 feet upstream from county-road crossing, 0.5 mile upstream from Guilford-Rockingham County Line,

Drainage area - 168 square miles.

Records available - October 1928 to date.

October 1928 to December 1945
Average discharge - 109 m.g.d.
Extreme maximum discharge - - 6520 m.g.d. Sept. 18, 1945 (gage height - 18.10 ft).
Extreme minimum discharge - 4.1 m.g.d. Sept. 1, 1932 (gage height - 0.73 foot).

Remarks - Records good.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	364	1830	534	840	263	393	471	337
Minimum mean weekly discharge (m.g.d.)	17	12	19	36	31	9.0	17	6.0
Maximum mean weekly discharge (c.f.s.)	563	2840	826	1300	407	609	729	522
Minimum mean weekly discharge (c.f.s.)	26	19	30	56	48	14	26	9.3
Maximum daily discharge (m.g.d.)	853	5160	1020	1780	541	756	1060	512
Maximum daily discharge (c.f.s.)	1320	7990	1580	2750	837	1170	1640	792
Mean daily discharge (m.g.d.)	80.8	124	121	137	83.3	73.6	105	77.5
Mean daily discharge (c.f.s.)	125	192	187	212	129	114	162	120
Minimum daily discharge (m.g.d.)	14	10	14	27	26	7.1	12	4.33
Minimum daily discharge (c.f.s.)	22	16	22	42	40	11	18	6.7

Haw River at Haw River, Alamance County

Location - Water-stage recorder at town of Haw River, 400 feet downstream from Southern Railway bridge and 3 miles downstream from Stony Creek.

Drainage area - 599 square miles.

Records available - October 1928 to date.

October 1928 to December 1945

Average discharge - 389 m.g.d.
Extreme maximum discharge - 23,900 m.g.d. Sept. 18, 1945 (gage height - 31.10 ft.) from high-water mark in gage shelter.
Extreme minimum discharge - 1.9 (regulated) m.g.d. Sept. 5, 1930 (gage height - 0.92 foot).

Remarks - Large diurnal fluctuation and some regulation for short periods at low flow caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	1720	4730	2330	2970	853	1670	1890	1610
Minimum mean weekly discharge (m.g.d.)	58	47	43	99	87	25	47	26
Maximum mean weekly discharge (c.f.s.)	2670	7320	3610	4600	1320	2580	2920	2490
Minimum mean weekly discharge (c.f.s.)	90	72	67	153	134	39	73	40
Maximum daily discharge (m.g.d.)	5510	15400	5410	4870	2330	5300	7750	3800
Maximum daily discharge (c.f.s.)	8530	23900	8380	9080	3600	8200	12000	5890
Mean daily discharge (m.g.d.)	301	399	435	479	275	258	430	310
Mean daily discharge (c.f.s.)	466	617	674	742	426	400	666	480
Minimum daily discharge (m.g.d.)	39	21	26	75	25	16	30	15
Minimum daily discharge (c.f.s.)	61	32	40	116	39	25	47	23

Haw River near Pittsboro, Chatham County

Location - Water-stage recorder, 100 feet upstream from Robinsons Creek, 2 miles downstream from bridge on State Highway 90, and 5 miles east of Pittsboro.

Drainage area - 1,310 square miles.

Records available - November 1928 to date.

November 1928 to December 1945

Average discharge - 835 m.g.d.

Extreme maximum discharge - 81,000 m.g.d. Sept. 18-19, 1945 (gage height - 28.58 feet) from high-water mark in gage station.

Extreme minimum discharge - 5.8 m.g.d. (regulated) Oct. 13, 1930 (gage height - 1.32 feet).

Flood of August 1908 reached a stage of about 32.1 feet (discharge - 63,300 m.g.d.), from rating curve extended above 29,700 m.g.d.

Remarks - Large diurnal fluctuation and some regulation for short periods at low flow caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	4440	5160	5410	5990	1990	3430	4670	3750
Minimum mean weekly discharge (m.g.d.)	103	86	52	160	102	21	85	19
Maximum mean weekly discharge (c.f.s.)	6680	7980	8370	9270	3080	5310	7230	5800
Minimum mean weekly discharge (c.f.s.)	160	133	80	248	158	33	132	29
Maximum daily discharge (m.g.d.)	16900	14300	15900	11700	5690	10100	22100	9300
Maximum daily discharge (c.f.s.)	26200	22200	24600	18100	8810	15600	34200	14400
Mean daily discharge (m.g.d.)	739	767	1010	986	550	470	941	680

	1946	1947	1948	1949	1950	1951	1952	1953
Mean daily discharge (c.f.s.)	1144	1187	1563	1527	852	727	1457	1052
Minimum daily discharge (m.g.d.)	30	12	4.72	45	7.1	5.0	35	3.42
Minimum daily discharge (c.f.s.)	46	19	7.3	70	11	7.8	54	5.3

Horsepen Creek near Battle Ground, Guilford County

Location - Water-stage recorder and modified Parshall flume at bridge on U. S. Highway 411, 0.75 mile north of Battle Ground, and about 2.5 miles upstream from mouth.

Drainage area - - 15.9 square miles.

Records available - November 1925 to July 1931, and May 1934 to date.

May 1934 to December 1945
Average discharge - 9.63 m.g.d.
Extreme maximum discharge - 995 m.g.d. Sept. 1945 (gage height - 7.93 feet).
Extreme minimum discharge - 0.45 m.g.d. July 24, 1926 (gage height - 0.72 foot), lowered datum.

Remarks - Records good.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	56	179	66	90	21	55	67	45
Minimum mean weekly discharge (m.g.d.)	2.09	1.48	1.52	3.23	2.19	1.25	1.79	1.12
Maximum mean weekly discharge (c.f.s.)	87	277	102	140	32	85	103	69
Minimum mean weekly discharge (c.f.s.)	3.23	2.29	2.36	5.0	3.39	1.93	2.77	1.74
Maximum daily discharge (m.g.d.)	247	698	202	323	76	281	343	183
Maximum daily discharge (c.f.s.)	383	1080	312	500	118	435	531	284
Mean daily discharge (m.g.d.)	8.1	11.3	11.6	13.0	6.98	6.98	11.3	9.95
Mean daily discharge (c.f.s.)	12.6	17.5	17.9	20.1	10.8	10.8	17.5	15.4
Minimum daily discharge (m.g.d.)	2.1	1.2	1.3	2.5	1.8	1.1	1.42	1.03
Minimum daily discharge (c.f.s.)	3.2	1.8	2.0	3.9	2.8	1.7	2.2	1.6

Lower Little River at Linden, Cumberland County

Location - Water-stage recorder at bridge on State Highway 21, 1.75 miles west of Linden, 2 miles upstream from Stewart Creek, and 4.5 miles upstream from mouth.

Drainage area - 460 square miles.

Records available - November 1928 to date.

November 1928 to December 1945
Average discharge - 358 m.g.d.
Extreme maximum discharge: not determined - approximately Sept. 18, 1945 during

period of back water from Cape Fear River (gage height - 41.47 feet).
Extreme minimum discharge - 17 m.g.d. (regulated), Oct. 14, 1940.

Remarks - Marked diurnal fluctuation and considerable regulation at low flow caused by power plant above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	1100	1270	1960	1820	956	544	1160	1250
Minimum mean weekly discharge (m.g.d.)	125	72	78	139	72	34	74	33
Maximum mean weekly discharge (c.f.s.)	1710	1970	3030	2810	1480	842	1790	1940
Minimum mean weekly discharge (c.f.s.)	193	112	121	215	112	52	114	51
Maximum daily discharge (m.g.d.)	1700	1890	2840	3130	1590	788	3570	1670
Maximum daily discharge (c.f.s.)	2630	2930	4400	4850	2460	1220	5520	2580
Mean daily discharge (m.g.d.)	422	379	477	429	244	149	338	298
Mean daily discharge (c.f.s.)	654	586	739	664	378	231	523	462
Minimum daily discharge (m.g.d.)	99	48	66	92	63	27	41	31
Minimum daily discharge (c.f.s.)	153	75	102	143	98	42	63	48

Northeast Cape Fear River near Chinquapin, Duplin County

Location - Water-stage recorder, 1,000 feet downstream from bridge on State Highway 41, 0.5 mile downstream from Muddy Creek, and 1.25 miles west of Chinquapin.

Drainage area - 600 square miles.

Records available - July 1940 to date.

July 1940 to December 1945
Average discharge - 373 m.g.d.
Extreme maximum discharge - 7100 m.g.d. Oct. 16, 1942 (gage height - 16.74 feet).
Extreme minimum discharge - 6.5 m.g.d. Oct. 25, 1941 (gage height - 0.68 feet).

Remarks - Records fair.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	1540	1880	3440	1890	4150	513	1460	937
Minimum mean weekly discharge (m.g.d.)	117	45	14	70	38	9.7	23	11
Maximum mean weekly discharge (c.f.s.)	2380	2910	5330	2930	6420	794	2260	1450
Minimum mean weekly discharge (c.f.s.)	181	70	22	109	59	15	35	17
Maximum daily discharge (m.g.d.)	2260	2120	4330	2840	5500	814	1600	1280
Maximum daily discharge (c.f.s.)	3500	3280	6700	4400	8520	1260	2480	1980
Mean daily discharge (m.g.d.)	507	526	646	587	372	171	266	293

	1946	1947	1948	1949	1950	1951	1952	1953
Mean daily discharge (c.f.s.)	785	814	1000	910	576	265	412	453
Minimum daily discharge (m.g.d.)	56	26	9.0	61	26	7.8	15	8.4
Minimum daily discharge (c.f.s.)	86	40	14	95	41	12	23	13

North Fork Buffalo Creek near Greensboro, Guilford County

Location - Water-stage recorder at county highway bridge 3 miles upstream from mouth and 6 miles northwest of Greensboro.

Drainage area - 36.4 square miles.

Records available - August 1928 to date.

August 1928 to December 1945
Average discharge - 28.7 m.g.d.
Extreme maximum discharge - 2490 m.g.d. Sept. 18, 1945 (gage height -14.40 feet).
Extreme minimum discharge - 1.0 m.g.d. Aug. 28, 1932.

Remarks - Diurnal fluctuation at low flows caused by mills above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	160	326	155	235	83	138	201	129
Minimum mean weekly discharge (m.g.d.)	9	8	9	12	13	9	12	9
Maximum mean weekly discharge (c.f.s.)	248	505	240	364	129	213	311	200
Minimum mean weekly discharge (c.f.s.)	14	12	14	19	20	14	19	14
Maximum daily discharge (m.g.d.)	685	1602	442	1176	331	646	891	580
Maximum daily discharge (c.f.s.)	1060	2480	684	1820	513	1000	1380	898
Mean daily discharge (m.g.d.)	26.7	32.8	35.9	39.1	26.1	27.1	38.0	30.1
Mean daily discharge (c.f.s.)	41.3	50.7	55.5	60.6	40.4	41.9	58.9	46.6
Minimum daily discharge (m.g.d.)	7	6	6	9	9	6	7.8	6.3
Minimum daily discharge (c.f.s.)	11	9	9	14	14	9	12	9.8

Reedy Fork near Gibsonville, Guilford County

Location - Water-stage recorder, 0.25 mile downstream from Huffines Mill, 1.25 miles upstream from Buffalo Creek, and 6 miles northwest of Gibsonville.

Drainage area - 133 square miles.

Records available - September 1928 to date.

September 1928 to December 1945
Extreme maximum discharge - 4740 m.g.d. Sept. 18, 1945 (gage height - 16.56 ft.).
Extreme minimum discharge - 0.39 m.g.d. sometime during period Nov. 12 to Dec. 8, 1941 (gage height - 0.65 foot), from range line.

Remarks - Considerable diurnal fluctuation caused by power plants above station. Flow partly regulated by reservoir, 14 miles above station, from which City of Greensboro diverted an average of 8.2 m.g.d. annually for water supply during the period 1929-1945.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	301	1450	453	641	149	264	385	286
Minimum mean weekly discharge (m.g.d.)	9.0	3.62	7.8	17	16	4.33	6.3	1.09
Maximum mean weekly discharge (c.f.s.)	466	2240	701	993	231	409	596	442
Minimum mean weekly discharge (c.f.s.)	14	5.6	12	27	24	6.7	9.7	1.69
Maximum daily discharge (m.g.d.)	1030	4680	1020	1590	313	611	1550	749
Maximum daily discharge (c.f.s.)	1590	7240	1580	2460	484	946	2400	1160
Mean daily discharge (m.g.d.)	58.7	82.0	78.2	98.8	49.8	43.7	76.2	56.8
Mean daily discharge (c.f.s.)	90.9	127	121	153	77.1	62.7	118	87.9
Minimum daily discharge (m.g.d.)	0.97	0.78	5.6	17	11	1.36	5.6	0.32
Minimum daily discharge (c.f.s.)	1.5	1.2	8.7	26	17	2.1	8.7	0.5

Rockfish Creek near Hope Mills, Cumberland County

Location - Water-stage recorder at bridge on U. S. Highway 301, just upstream from Little Rockfish Creek, 1.75 miles east of town of Hope Mills, and 5.75 miles upstream from confluence of Rockfish Creek and Cape Fear River.

Drainage area - 284 square miles, including that of Little Rockfish Creek.

Records available - February 1939 to December 31, 1954, at which time the station was discontinued.

February 1939 to December 1945
Average discharge - 216 m.g.d.
Extreme maximum discharge - 5170 m.g.d. Sept. 18 1945 (gage height - 31.75 ft.).
Extreme minimum discharge - 1.68 m.g.d. (regulated) Oct. 24, Nov. 22,23, 1941 (gage height - 3.28 feet).

Remarks - Large diurnal fluctuation and considerable regulation caused by mills and reservoirs above station.

	1946	1947	1948	1949	1950	1951	1952	1953	1954
Maximum mean weekly discharge (m.g.d.)	608	685	724	1120	494	282	623	486	621
Minimum mean weekly discharge (m.g.d.)	163	101	128	171	125	86	78	74	57
Maximum mean weekly discharge (c.f.s.)	941	1060	1120	1740	764	437	964	753	961
Minimum mean weekly discharge (c.f.s.)	253	157	198	265	193	133	120	115	89
Maximum daily discharge (m.g.d.)	1450	885	969	1970	775	392	1880	820	1110
Maximum daily discharge (c.f.s.)	2240	1370	1500	3050	1200	607	2910	1270	1720

	1946	1947	1948	1949	1950	1951	1952	1953	1954
Mean daily discharge (m.g.d.)	299	258	311	313	218	156	213	218	202
Mean daily discharge (c.f.s.)	463	400	482	485	338	241	330	337	313
Minimum daily discharge (m.g.d.)	45	8	12	17	8	13	17	21	14
Minimum daily discharge (c.f.s.)	69	13	19	27	13	20	27	33	21

South Fork Buffalo Creek near Greensboro, Guilford County

Location - Water-stage recorder at county highway bridge 3 miles upstream from mouth and 8 miles northwest of Greensboro.

Drainage area - 36.4 square miles.

Records available - August 1928 to date.

August 1928 to December 1945
Average discharge - 28.7 m.g.d.
Extreme maximum discharge - 2490 m.g.d. Sept. 18, 1945 (gage height - 14.40 ft.).
Extreme minimum discharge - 1.0 m.g.d. Aug. 28, 1932.

Remarks - Diurnal fluctuation at low flow caused by mills above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	176	385	171	554	83	213	196	147
Minimum mean weekly discharge (m.g.d.)	3.29	2.59	3.88	4.54	4.52	2.71	5.3	3.36
Maximum mean weekly discharge (c.f.s.)	273	596	264	858	129	329	303	228
Minimum mean weekly discharge (c.f.s.)	5.1	4.01	6	7.2	7.0	4.20	8.2	5.2
Maximum daily discharge (m.g.d.)	736	2260	610	3530	320	859	1010	557
Maximum daily discharge (c.f.s.)	1140	3500	944	5460	496	1330	1560	862
Mean daily discharge (m.g.d.)	20.8	28.7	30.6	42.0	17.8	19.5	35.4	27.4
Mean daily discharge (c.f.s.)	32.2	44.4	47.3	65.0	27.6	30.2	54.8	42.4
Minimum daily discharge (m.g.d.)	2.7	1.9	3.2	3.9	4.1	1.9	2.71	2.26
Minimum daily discharge (c.f.s.)	4.2	2.9	5.0	6.1	6.4	2.9	4.2	3.5

West Fork Deep River near High Point, Guilford County

Location - Water-stage recorder and modified Parshall flume, 0.25 mile upstream from State highway bridge at head of High Point Reservoir, about 2 miles northwest of Jamestown, Guilford County, and 3.5 miles northwest of High Point.

Drainage area - 32.1 square miles.

Records available - June 1923 to September 1926, and July 1928 to date.

June 1923 to September 1926 and July 1928 to December 1945
Average discharge - 20.3 m.g.d.

Extreme maximum discharge - 1860 m.g.d. Jan. 19, 1936 (gage height - 13.84 feet).
Extreme minimum discharge - 0.19 m.g.d. Sept. 1, 1932.

Remarks - Occasional marked diurnal fluctuation caused by gristmill 4 miles above station.

	1946	1947	1948	1949	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	154	380	132	200	50	74	143	104
Minimum mean weekly discharge (m.g.d.)	4.39	2.46	4.26	5.9	4.39	2.03	3.62	1.89
Maximum mean weekly discharge (c.f.s.)	239	589	205	309	78	115	222	161
Minimum mean weekly discharge (c.f.s.)	6.8	3.81	6.6	9.1	6.8	3.14	5.6	2.93
Maximum daily discharge (m.g.d.)	717	1290	384	840	257	267	736	496
Maximum daily discharge (c.f.s.)	1110	2000	595	1300	398	414	1140	768
Mean daily discharge (m.g.d.)	19.4	24.2	24.5	27.6	14	13	25.5	20.7
Mean daily discharge (c.f.s.)	30.0	37.4	37.9	42.7	20.9	19.6	39.5	32.1
Minimum daily discharge (m.g.d.)	3.9	1.8	3.7	4.3	3.8	1.9	2.97	1.55
Minimum daily discharge (c.f.s.)	6.1	2.8	5.7	6.6	5.9	3.0	4.6	2.4

The following gaging stations, stream-flow records for which are shown in "Hydrologic Data on the Cape Fear River Basin, 1820-1945", have been discontinued in addition to Rockfish Creek near Hope Mills, Cumberland County:

Cape Fear River at Fayetteville, Cumberland County
Lower Little River at Manchester, Cumberland County.

Records for gaging stations, established subsequent to January 1, 1949, are shown below.

Black River near Tomahawk, Sampson County

Drainage area - 680 square miles

	1952	1953
Maximum mean weekly discharge (m.g.d.)	1240	885
Minimum mean weekly discharge (m.g.d.)	40	19
Maximum mean weekly discharge (c.f.s.)	1920	1370
Minimum mean weekly discharge (c.f.s.)	62	30
Maximum daily discharge (m.g.d.)	1350	963
Maximum daily discharge (c.f.s.)	2090	1490
Mean daily discharge (m.g.d.)	298	251
Mean daily discharge (c.f.s.)	462	389
Minimum daily discharge (m.g.d.)	28	16
Minimum daily discharge (c.f.s.)	43	25

Colly Creek near Kelly, Bladen County

Drainage area - 85.2 square miles.

	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	337	115	149	198
Minimum mean weekly discharge (m.g.d.)	4.78	0.19	0.12	0.0
Maximum mean weekly discharge (c.f.s.)	522	178	231	306
Minimum mean weekly discharge (c.f.s.)	7.4	0.30	0.19	0.0
Maximum daily discharge (m.g.d.)	418	127	161	222
Maximum daily discharge (c.f.s.)	647	196	249	344
Mean daily discharge (m.g.d.)	77.5	31.8	36.9	42.7
Mean daily discharge (c.f.s.)	120	49.3	57.1	66.1
Minimum daily discharge (m.g.d.)	2.13	0.0	0.0	0.0
Minimum daily discharge (c.f.s.)	3.3	0.0	0.0	0.0

Little Coharie Creek near Roseboro, Sampson County

Drainage area - 96.4 square miles

	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	150	201	261	196
Minimum mean weekly discharge (m.g.d.)	3.55	2.91	1.21	.388
Maximum mean weekly discharge (c.f.s.)	232	311	404	304
Minimum mean weekly discharge (c.f.s.)	5.5	4.51	1.87	.600
Maximum daily discharge (m.g.d.)	340	330	357	245
Maximum daily discharge (c.f.s.)	526	511	553	379
Mean daily discharge (m.g.d.)	33.1	36.3	56.7	38.8
Mean daily discharge (c.f.s.)	51.3	56.2	87.7	60.0
Minimum daily discharge (m.g.d.)	2.71	2.45	0.84	0.32
Minimum daily discharge (c.f.s.)	4.2	3.8	1.3	0.5

New Hope River near Pittsboro, Chatham County

Drainage area - 285 square miles

	1950	1951	1952	1953
Maximum mean weekly discharge (m.g.d.)	565	736	1650	1100
Minimum mean weekly discharge (m.g.d.)	11	3.42	6.1	2.07
Maximum mean weekly discharge (c.f.s.)	875	1140	2560	1700
Minimum mean weekly discharge (c.f.s.)	17	5.3	9.4	3.20
Maximum daily discharge (m.g.d.)	1020	1370	4480	2740
Maximum daily discharge (c.f.s.)	1580	2120	6940	4240
Mean Daily discharge (m.g.d.)	105	74.3	216	206
Mean daily discharge (c.f.s.)	162	115	335	319
Minimum daily discharge (m.g.d.)	6.2	2.91	6.5	1.42
Minimum daily discharge (c.f.s.)	9.6	4.5	10	2.2

South River near Parkersburg, Sampson County

Drainage area - 382 square miles

	1952	1953
Maximum mean weekly discharge (m.g.d.)	846	519
Minimum mean weekly discharge (m.g.d.)	7.8	1.44
Maximum mean weekly discharge (c.f.s.)	1310	804
Minimum mean weekly discharge (c.f.s.)	12	2.23
Maximum daily discharge (m.g.d.)	956	568
Maximum daily discharge (c.f.s.)	1480	880
Mean daily discharge (m.g.d.)	174	138
Mean daily discharge (c.f.s.)	269	214
Minimum daily discharge (m.g.d.)	3.49	1.16
Minimum daily discharge (c.f.s.)	5.4	1.8

Stony Creek near Burlington, Alamance County

Drainage area - 44.2 square miles

	1953
Maximum mean weekly discharge (m.g.d.)	138
Minimum mean weekly discharge (m.g.d.)	.006
Maximum mean weekly discharge (c.f.s.)	213
Minimum mean weekly discharge (c.f.s.)	.01
Maximum daily discharge (m.g.d.)	632
Maximum daily discharge (c.f.s.)	979
Mean daily discharge (m.g.d.)	19.4
Mean daily discharge (c.f.s.)	30.1
Minimum daily discharge (m.g.d.)	0.0
Minimum daily discharge (c.f.s.)	0.0

Lakes, Ponds, and Reservoirs - Examinations of North Carolina State Highway and Public Works Commission maps indicate that the following lakes, ponds, and reservoirs are located in the Cape Fear River Basin:

County	Name	Stream on which located
Alamance	Lake Burlington	Jordans Creek
Bladen	Singletary Lake	Lake Run
Bladen	Black Lake	Lake Creek
Bladen	Smiths Pond	Tributary of South River
Bladen	Jones Lake	Branch of Turnbull Creek
Bladen	Salters Lake	Branch of Ellis Creek
Bladen	Suggs Mill Pond	Ellis Creek
Bladen	Little Singletary Lake	Branch of Ellis Creek
Bladen	Bakers Lake	Phillips Creek
Brunswick	Orton Pond	Orton Creek
Brunswick	McKinzie Pond	Lilliput Creek
Cumberland	Rhodes Pond	South River
Guilford	High Point Reservoir	Deep River
Guilford	White Oak Lake	Branch of North Buffalo Creek

County	Name	Stream on which located
Guilford	Buffalo Lake	Branch of North Buffalo Creek
Guilford	Philadelphia Lake	Branch of North Buffalo Creek
Guilford	Lake Brandt	Reedy Fork Creek
Harnett	Hayner Pond	Mingo Swamp
Harnett	Marks Pond	Buffalo Creek
Moore	Thaggards Pond	Lower Little River
Moore	McCaskill Pond	Nicks Creek
New Hanover	Greenfield Lake	Tributary of Cape Fear River
Orange	University Lake	Morgan Creek
Sampson	Houses Pond	Sevenmile Swamp
Wayne	Williams Pond	Tributary of N.E. Cape Fear River

CHAPTER VII - - GROUND WATER

The following information is extracted from "Hydrologic Data on the Cape Fear River Basin, 1820-1945", published in 1947 by the North Carolina Department of Conservation and Development and prepared in cooperation with the Geological Survey, U. S. Department of the Interior, and the U. S. Weather Bureau.

General - - Ground water is an important natural resource in the Cape Fear River Basin. It is the source of supply for 30 cities and towns and several military establishments. Nearly all domestic water supplies and many industrial supplies are obtained from wells or springs.

Although detailed investigations have been completed in only a part of the basin, a large amount of basic data and other information has been obtained for all parts of the area.

The Cape Fear River Basin lies in two major physiographic provinces which differ greatly in topography and geology and in their ground-water resources. The headwaters of the Cape Fear River, including Deep and Haw Rivers, are in the Piedmont province. The lower reaches of the river and some of its tributaries, including Lower Little River, South River, Black River, and Northeast Cape Fear River, are in the Coastal Plain province. The two provinces are separated by a belt known as the Fall Zone, which extends generally along the Atlantic Coast Line Railroad between Weldon and Fayetteville, thence west to Southern Pines, and thence along the Seaboard Air Line Railroad to the North Carolina-South Carolina State Line.

Occurence of ground water - - In the crystalline and consolidated rocks of the Piedmont province, ground water moves largely through joints and fractures and along cleavage planes. In the unconsolidated, sedimentary formations of the Coastal Plain province, it moves through the openings between the grains of soil, sand, and clay.

Ground water moves under the influence of gravity, and the point of discharge is always at a lower level than the point of recharge. In North Carolina, recharge occurs in interstream areas, and the natural discharge is into streams, lakes, swamps, and the sea.

Rain, falling on the surface, percolates downward through the earth until it reaches the zone of saturation, below which the pores and openings of the rock are completely filled with water. The surface of the zone of saturation is called the water table, and, in the Cape Fear River Basin, it generally is from a few feet to about 60 feet below the land surface. Discharge of ground water is a continuous process, though the rate varies from time to time. Thus, the ground-water levels are receding continually, except when recharge from precipitation exceeds the rate of depletion and the water levels rise. For this reason, the water table is not a fixed surface but is continually fluctuating. In North Carolina, the water table generally recedes during the summer and autumn months in spite of heavy rainfall, because of the large amount of water lost by evaporation, and transpiration losses are greatly reduced.

Geology and ground-water resources of the Piedmont Area - - The Piedmont area of the Cape Fear River Basin includes parts of Forsyth, Rockingham, Guilford, Randolph, Caswell, Alamance, Orange, Durham, Wake, Chatham, Moore, Lee, and Harnett Counties. The rocks of this area include granites, gneisses, schists, and slates of Paleozoic age, or older, and consolidated, sedimentary rocks of

Triassic age. The productiveness of the rocks ranges widely, not only from one type of rock to another but also from place to place within each rock type. Data obtained to date indicates that the schists included in the slate belt are the best aquifers, the gneisses probably are second, and the granites third. The Triassic rocks are probably among the poorest of the major aquifers in the Piedmont.

One of the most important problems in the Piedmont is to select the best possible location for drilling a well to obtain the maximum quantity of water. Factors to be considered in selecting a well site include texture of the rock, amount and kind of jointing, fracturing, shearing, bedding planes, cleavage and schistosity, veins, dikes, topographic location, and thickness of weathered mantle.

The coarser-textured rocks generally are more productive than the finer-textured ones, probably because fracturing or shearing of the course-grained rocks produces larger openings than it does in fine-grained ones. Wells, drilled where joints, fractures, and shearing places are closely spaced, usually are more productive than wells drilled where these openings are more widely spaced. In rocks of sedimentary origin, important openings may occur along bedding planes and, in metamorphic rocks, whether of sedimentary or igneous origin, planes of cleavage and schistosity are important in the occurrence and movement of ground water. Places where these planes are prominent and closely spaced generally are more productive than places where they are widely spaced.

Quartz veins are very important avenues in the storage and movement of ground water. Quartz is a hard, brittle material which fractures easily and breaks into relatively large, irregular fragments when subjected to earth stresses. Ground water can usually move much more readily through quartz veins than in the adjacent rock. Wells intersecting one or more quartz veins generally are much more productive than wells which do not.

Dikes are walls of lava which were injected into crevices in the adjacent rock when the lava was molten. Generally, the adjacent rock has been considerably fractured and broken by the injection, and, in most places, wells drilled near dikes yield considerably more water than wells drilled into the undisturbed rock some distance from the dikes. However, most dikes, themselves, do not yield much water.

The rocks of the Piedmont area at most places are very deeply weathered; and, at many places, the thick layer of weathered material forms such an extensive cover over the underlying rock that little direct evidence is available regarding fracturing, cleavage, and the presence of veins and dikes. However, the topography frequently gives indirect evidence regarding these factors. In an area being actively worn down by erosion, as is the Piedmont of North Carolina, hills are left because they are relatively resistant to erosion. Valleys, "draws" (small vallies or gullies), and similar depressions are formed where the rocks are less resistant. At many places, this lower resistance is due to the greater fracturing of the rock, which permits circulation of ground water and promotes chemical decay of the rocks, making them easy to erode. Obviously, such places are more favorable for drilling wells than the hills, which are underlain by less fractured rock. In the Greensboro area, it was found that the average yield of wells drilled in topographic depressions was more than three times as large as the yield of wells drilled on hills. Another reason that a depression is a more favorable location for a well is that the natural movement of the ground water is into the depressions and away from the hills.

The thickness of the saprolite (weathered rock) is important. In the Greensboro area, the average yield of wells, in which the weathered mantle was 30 feet or less in thickness, was about 8 gallons a minute. The average yield of wells, in which the thickness of mantle ranged from 31 to 65 feet, was about 17 gallons a minute, and the average yield of wells, in which the thickness of mantle was 66 feet or more, was about 25 gallons a minute. The thick layer of saprolite stores large quantities of water which moves into the fractures of the underlying rock when the well is pumped.

Water from wells in the Piedmont generally is soft or only slightly hard. Many wells yield water with little or no iron; a considerable number yield water with objectionable iron. The temperature of the water ranges from about 60 degrees to 64 degrees Fahrenheit.

The average yield of 16 wells in gneiss, which crops out in a narrow belt, extending southwestward from Fuquay Springs in Wake County across the corner of Harnett and Chatham Counties into Lee County, and which occurs in an irregular belt, extending from Forsyth County across the northwestern corner of Guilford County into Rockingham County, is 50 gallons a minute. One of these wells at Fuquay Springs yields 330 gallons a minute. Careful consideration of all of the factors, mentioned above in the selection of a well site, may be expected to result in a somewhat larger average yield for wells drilled in the gneiss.

Slate and schist underlay approximately two-thirds of the Piedmont section of the Cape Fear River Basin. They occur in two belts, the eastern belt extending from Moore County northeastward through Lee and Harnett Counties into Wake and Johnston Counties and the northwestern belt extending from the northwest corner of Moore County across Randolph, Chatham, Orange, and Durham Counties. It also occupies considerable areas in Alamance and Guilford Counties. The schist of the eastern belt is one of the most productive aquifers in the Piedmont. The average of seven wells in the eastern schist belt is 49 gallons a minute. The greenstone schist in the northwestern belt apparently is as good an aquifer as the schist in the eastern belt. In the Greensboro area, the average yield of 56 municipal and industrial wells in the greenstone schist was 55 gallons a minute. The large central mass of slate cropping out in Randolph, Chatham, southeastern Alamance, Orange, and Durham Counties is a relatively poor aquifer. The average yield of 26 wells in this area is 17 gallons a minute. Quartz veins are very important in the drilling of successful wells in the slates and schists. It is probable that most successful wells in this rock-unit owe their success to the intersection of quartz veins. Topographic location and thickness of weathered mantle are also important factors in selection of a well site in these rocks.

Granite crops out in irregular patches chiefly in northern Randolph County and in Guilford, Alamance, and Caswell Counties. Another area of granite, separated from the main area by the slate belt, occurs in the vicinity of Chapel Hill in Orange County and extends southward to Bynum in Chatham County. Horizontal joints are very important, and, because these joints decrease in number with depth, less and less ground water is obtained with increasing depth. At places where the granite has been considerably sheared and fractured, wells will yield moderate supplies of ground water, but in areas of massive granite little or no water can be obtained. In the Greensboro area, 163 wells have an average yield of 12 gallons a minute. These include domestic, industrial, municipal, and public-supply wells. The 26 industrial and municipal wells in the group have an average yield of about 33 gallons a minute. The

average yield of 29 wells drilled in granite in the Cape Fear River Basin is 24 gallons a minute. The average yield of wells can be increased considerably by a careful selection of drilling locations, basing the choice on geological and topographical evidence. The number and size of joints and fractures in granite decrease rapidly with increasing depth, and most wells obtain a large proportion of their water at relatively shallow depth. Drilling beyond 250 or 300 feet is rarely advisable, and wells with small yields at 150 to 200 feet have little chance of getting more water at greater depth.

The Triassic rocks assigned to the Newark group, consisting chiefly of sandstones, shales, mudstones, and conglomerates, crop out in a belt extending southwestward from Durham and Wake Counties across the southeastern corner of Chatham County and the northwestern half of Lee County through Moore County. At many places, these rocks are among the poorest aquifers in the Piedmont. At a few places in the Cape Fear River Basin, however, moderate supplies can be obtained. The coarser-grained strata usually yield larger supplies than the finer-grained ones, probably because fracturing tends to create larger openings. Where the strata are greatly fractured, good yields are usually obtained. The many diabase dikes which have been injected into the Triassic rocks have broken the adjacent strata, and wells drilled near these dikes generally yield much more water than wells drilled farther away. Wells drilled in the conglomerate along the eastern margin of the belt also usually have better-than-average yields. The yields of many wells decline greatly after pumping for long periods. The reason may be that the water, stored in the small pores in the rock near the well, can move readily into crevices and thence into the well under the high gradients existing there, but it is replaced only slowly by lateral flow through the pores from greater distances. Thus, after this storage is exhausted, most of the water flowing into the well must travel through joints and fractures. The average yield of five wells in Triassic Strata is 10 gallons a minute.

Public ground-water supplies in the Piedmont area - There are nine municipal ground-water supplies in the Piedmont area of the Cape Fear River Basin, serving a population of 12,980 (1940 census).

Angier, in Harnett County, obtains its water from two wells in slate. Both wells are 8 inches in diameter; one of them, 292 feet deep, yields 80 gallons a minute; the other, 250 feet deep, yields 60 gallons a minute. The 292-foot well, at the north end of the town, is used regularly, and the water is aerated for removal of iron. The other well is used as an auxiliary source.

Carthage, in Moore County, obtains its water from seepage springs in a small basin about one mile southeast of the town. The springs have been developed by laying many hundred feet of terra-cotta pipe to collect the water from the many seepages. Consumption of water averages about 100,000 gallons a day, and the yield is insufficient to supply the needs during periods of fair weather when the yield of the springs decreases. The water is treated by the addition of sodium hydroxide and by chlorination.

Elon College, in Alamance County, obtains its water from two drilled wells in greenstone schist. One well, drilled on a hill, is 900 feet deep and yields 33 gallons a minute. The other well, drilled in a shallow draw, is 300 feet deep and yields 150 gallons a minute. Both wells are 8 inches in diameter. The water is not treated.

Fuquay Springs, in Wake County, obtains its water from four wells ranging in depth from 250 to 400 feet and in yield from 60 to 330 gallons a minute. These wells are drilled in gneiss. The water is treated in a modern treatment plant for the removal of iron and partial softening.

Gibsonville, in Guilford County, obtains its water from two drilled wells, one in Guilford County and the other in Alamance County. The well in Guilford County is 201 feet and yields 800 gallons a minute. The well in Alamance County is 335.5 feet deep and was tested at 112 gallons a minute. The water is not treated.

Graham, in Alamance County, obtains its water from six drilled wells ending in greenstone schist which is included with the slate and schist unit. The wells are all 8 inches in diameter. Five of the six range in depth from 354 to 501 feet and have yields ranging from 30 to 45 gallons a minute. The sixth well, 1,005 feet deep, yields about 40 gallons a minute. The water is not treated.

Liberty, in Randolph County, obtains its water from three wells drilled in the slate and schist unit. The rock is probably a greenstone schist. The wells range in depth from 175 to 360 feet and in yield from 60 to 100 gallons a minute. The water is not treated.

Lillington, in Harnett County, obtains its water from four wells ranging in depth from 291 to 460 feet and in yield from 24 to 90 gallons a minute. Three of the wells yield water with a moderately low iron content, but the water of the fourth well contains a considerable amount of iron.

Pittsboro, in Chatham County, obtains most of its water supply from seepage springs in a shallow basin south of the town, near Robeson Creek. The water issues from the residual weathered material above slate and is collected in a concrete sump and in an infiltration trench below a low dam across the basin. The flow from the springs varies from about 15 to 40 gallons a minute. The spring supply is supplemented from Robeson Creek or by water from a well. The well is 400 feet deep and yields 24 gallons a minute. The water from the springs is chlorinated, and that from the creek is filtered and chlorinated. The well water is not treated.

Geology and ground-water resources of the Coastal Plain - Counties partly or entirely within the Coastal Plain section in the Cape Fear River Basin include Harnett, Cumberland, Hoke, Bladen, Sampson, Duplin, Onslow, Pender, New Hanover, and Brunswick.

In contrast with the consolidated sediments and crystalline rocks of the Piedmont, the formations in the Coastal Plain consist of beds of unconsolidated and semi-consolidated sand, clay, marl, shale, and some limestones and occasional sandstone layers. In most parts of the Coastal Plain except the area immediately southeast of the Fall Zone, where the strata are thin, the sediments will yield large quantities of water to wells. The total potential ground-water supply in the Coastal Plain section of the Cape Fear River Basin is several hundred million gallons a day, and individual supplies of several million gallons daily can be obtained at many places. Wells capable of yielding 1,000 gallons a minute or more have been drilled at a number of places. The water from the northwestern two-thirds of the Coastal Plain area is soft and low in dissolved solids. At some places, it contains considerable quantities of iron. Near the coast, most ground waters are hard. Salt water is found at depths ranging from about 140 feet to 300 feet immediately adjacent to the large estuaries, such as New River as far inland as Jacksonville and the Cape Fear and Northeast Cape Fear Rivers as far inland as U. S. Lock No. 1 and Burgaw, respectively. In the interstream areas between these estuaries, however the depth to salt water is much more, generally being more than 500 feet. Ground water temperatures range from about 62 to 65 degrees Fahrenheit.

The Tuscaloosa Formation is the basal sedimentary formation of the Coastal Plain in the Cape Fear River Basin, lies directly upon the irregular surface of the basement rock, and consists of varicolored sands, clays, and some gravel. The sands and gravel are somewhat clayey at many places. The clay often contains considerable sand and is usually micaceous. The formation thickens from a feather edge along the Fall Zone to about 300 feet where it passes beneath the Black Creek Formation. Farther down its southeastward dip, the Tuscaloosa Formation apparently becomes thinner and is evidently only about 30 feet thick at Wilmington and Fort Caswell. It is one of the best aquifers in the Coastal Plain and will yield several hundred gallons a minute to wells at almost any place except along the northwestern margin where it is thin. Wells yielding from 500 to 1,000 gallons a minute have been drilled at a number of places, although none yielding that much has been drilled so far in the Cape Fear River Basin. Two towns in this basin obtain their water supply from the Tuscaloosa Formation. The average yield of the nine wells, yielding water from the Tuscaloosa Formation, is 90 gallons a minute. The potential supply from the Tuscaloosa Formation is many times the amount now being utilized. Water from this formation generally is soft and low in dissolved solids. At some places, however, the water contains objectionable amounts of iron.

The Black Creek Formation crops out in a belt southeast of that of the Tuscaloosa Formation. Farther to the southeast, it is overlain by the Peedee Formation. The Black Creek Formation includes black laminated clays and interbedded fine-grained gray sands, lignitized wood, sands and clays interbedded with marls, and thin layers of calcareous sandstones and shellrock. It is an excellent aquifer at most places, and wells, yielding several hundred gallons a minute, can be obtained at many places. Thirteen wells in this formation yield an average of 225 gallons a minute. The potential supply from this formation is many million gallons a day, of which only a small part is being utilized. The area, in which wells can obtain water from the Black Creek Formation, extends, from its western limit of outcrop, eastward within 10 or 15 miles of the coast. Beyond that point, the water would probably be too brackish for use. Water from the lower part of the formation is soft and low in dissolved solids; that from the upper part is considerably harder. At some places, the water contains considerable amounts of iron.

The Peedee Formation overlies the Black Creek Formation and crops out in a belt to the southeast. It consists of marine sands, clays, marls, limestones, and shells. It is an excellent aquifer at most places. Wells capable of yielding several hundred to more than a thousand gallons a minute have been drilled at a number of places. The average yield of 32 wells in the formation is 199 gallons a minute. The area, in which water supplies can be obtained from the Peedee Formation, extends from its northwestern limit of outcrop to the coast. Immediately adjacent to the coast, the water may be too brackish for use. The water from the formation generally is hard.

Isolated outcrop of strata of lower Eocene age have been found at a number of places in Wake and Harnett Counties. These strata usually consist of siliceous limestone or calcareous sandstone. There are, in the same areas in which these isolated patches of fossiliferous Eocene strata occur, extensive deposits of sand and gravel of unknown age. These sands and gravels crop out over much of the southern part of Wake County, most of Harnett and Lee Counties, and a considerable part of Wake County. They also occur in the southeastern corner of Chatham County. Water is obtained from some drilled wells in these sand and gravel deposits, and many domestic dug and bored wells obtain water from them. The Town of Carthage obtains its water supply from springs discharging from the gravels just above a layer of clay. At many places, the sand and

gravel are quite permeable, and considerable quantities of water might be available from them.

The Castle Hayne marl overlies the Peedee Formation, crops out in eastern Duplin County and western and northwestern Onslow County, and extends across Pender and New Hanover Counties into Brunswick County. It consists of sand, sandy marl, sandy limestone, and some nearly pure limestone. It yields large quantities of water at a number of places. The best aquifers are porous limestone and shell-rock strata. Large quantities of water from this formation are obtained from Pollocksville in Jones County southwestward through Jacksonville and Holly Ridge to Wilmington and Southport. Many wells, drilled in this formation, have yielded 300 or 400 gallons a minute with very small drawdowns. The average yield of 38 wells in this formation is 209 gallons a minute.

The Trent marl crops out in a belt southeast of that of the Castle Hayne marl and extends from a point near Holly Ridge through Jacksonville to New Bern. It consists of sand, sandy marl, sandy limestone, and coquina, a soft, whitish limestone, of broken shells and corals cemented together. Many of the limestone and shell-rock strata are very permeable and yield large quantities of water to wells. Large yields have been obtained in a number of wells in Onslow County. Yields of several hundred gallons a minute, with small drawdowns, have been obtained in a number of wells at Camp Lejeune. Water from the Trent marl is hard and, at many places, contains considerable iron.

The Duplin marl crops out in patches lying upon the beveled surface of the older Coastal Plain formation in Duplin, Sampson, and Bladen Counties. It is also penetrated by wells on the coast of Onslow County and northeastward, where it consists of sand, sandy marl, and limestone. The Duplin marl is not important as an aquifer in the areas where it crops out in Duplin, Sampson, and Bladen Counties. It is, however, a good aquifer along the coast in Onslow County. Some of the wells, supplying parts of Camp Lejeune, obtain their water from the Duplin marl, and most of the wells in the vicinity of Swansboro obtain water from it. Yields of several hundred gallons a minute, with small drawdowns, can be obtained at most places in that area.

The Pleistocene deposits, consisting of sandy clay, clayey sand, and some clean sand and gravel occur, in a belt along the coast in Onslow, New Hanover, and Brunswick Counties. Many domestic water supplies and a number of industrial supplies are obtained from these deposits. The yield of an individual well is usually small. Batteries of small-diameter wells, however, furnish moderate supplies. Supplies up to a million gallons a day can be obtained at some places in the Cape Fear River Basin, and smaller supplies can be obtained at many other places. Water from these deposits is generally soft. At many places, it contains a considerable amount of iron.

Public ground-water supplies in the Coastal Plain area - There are 21 municipal ground-water supplies in the Coastal Plain area of the Cape Fear River Basin.

Burgaw, in Pender County, obtains its water from a gravel-walled well 220 feet deep in sands of the Peedee Formation. The hole is 24 inches in diameter, with gravel placed around an 8-inch slotted pipe in the center. The well was tested at 150 gallons a minute with a drawdown of five feet. The water has a hardness of 142 parts per million. Treatment consists of aeration over coke and filtration. About 35,000 gallons of water are used daily.

Carolina Beach, in New Hanover County, obtains its water from three wells,

195 to 200 feet deep and yielding 150 to 300 gallons a minute each. The water comes from shell rock in the Castle Hayne marl. The maximum consumption, during the summer months, is about 400,000 gallons a day. The water is not treated.

Clinton, in Sampson County, obtains its water from two gravel-walled wells, 260 and 267 feet deep, yielding 350 and 600 gallons a minute, respectively, from sands of the Black Creek Formation. The hardness of the water is about 50 parts per million. The water is not treated. About 350,000 gallons of water are used daily.

Coats, in Harnett County, is supplied with water from a spring supply owned by Fred Byrd. The spring consists of four or five seepage areas issuing from sand at the foot of a hill about a quarter of a mile southwest of town. The water is collected by infiltration into a soil pipe along the base of the hill. The average yield is about 20,000 gallons a day. It decreases considerably, however, during prolonged dry weather. The water is chlorinated. About 10,000 gallons are used each day.

Elizabethtown, in Bladen County, obtains its water from a gravel-walled well 199 feet deep ending in the sands of the Black Creek Formation. The well was tested at 150 gallons a minute with a drawdown of 18 feet.

Faison, in Duplin County, obtains its water from two drilled wells about 200 feet deep, ending in sand of the Black Creek Formation. One well yields 90, and the other yields 100, gallons a minute. The water has a hardness of 20 to 50 parts per million and is not treated. About 50,000 to 60,000 gallons are used each day.

Holly Ridge, in Onslow County, obtains its water from a drilled well 180 feet deep ending in shell rock of the Castle Hayne marl. The well is 8 inches in diameter and was tested at a rate of 330 gallons a minute. The water has a hardness of about 200 parts per million.

Jacksonville, in Onslow County, obtains its water from three wells ranging in depth from 185 to 200 feet. These wells end in shell rock of the Castle Hayne marl, and the yields range up to 300 gallons a minute. Consumption ranges from about 200,000 to 250,000 gallons a day. The water has a hardness of about 200 to 225 parts per million. It is not treated.

Kenansville, Duplin County, obtains its water from a drilled well, 198 feet deep, in sand of the Black Creek Formation. The well yields 200 gallons a minute. The water has a hardness of 111 parts per million and is not treated.

Raeford, in Hope County, obtains water from two wells, each of which is 12 inches in diameter and 75 feet deep and yields 100 gallons a minute. The wells are screened in sand of the Tuscaloosa Formation. Treatment consists of aeration and addition of lime. The water has a hardness of 10 parts per million. About 100,000 gallons are used daily.

Richlands, in Onslow County, obtains its water from a drilled well 550 feet deep ending in sand of the Peedee Formation. The well yields 100 gallons a minute. The water has a hardness of 36 parts per million and is not treated. Consumption averages about 25,000 gallons a day.

Roseboro, in Sampson County, obtains its water from fourteen 1.25-inch driven wells, each equipped with a 5-foot strainer and point. The wells are

from 45 to 48 feet deep and are pumped by two suction pumps with a combined yield of 120 gallons a minute. The aquifer is coarse sand in the Black Creek Formation. The water is soft and contains much iron. It is not treated. About 80,000 gallons a day are used.

Rose Hill, in Duplin County, obtains water from a drilled well, 186 feet deep, in sand of the Black Creek Formation. The well yields 150 gallons a minute. The water has a hardness of 136 parts per million and is not treated. About 40,000 gallons are used each day.

Southport, in Brunswick County, obtains water from two wells 110 and 120 feet, yielding 50 and 150 gallons a minute, respectively. The wells are screened in sand of the Castle Hayne marl. The water has a hardness of about 180 parts per million and is not treated. About 200,000 gallons are used daily.

Spring Lake, in Cumberland County, obtains water from three wells each 75 feet deep, with yields of about 40 gallons a minute each. The wells are screened in sands of the Tuscaloosa Formation. The water is not treated. About 100,000 gallons of water are used each day.

Sunset Park, in New Hanover County, obtains its water from eight wells, ranging in depth from 91 to 143 feet and in yield from 60 to 150 gallons a minute. Not all of the wells are being used at the present time. The water is obtained from shell rock of the Peedee Formation and has a total hardness of 96 parts per million. Consumption ranges from 150,000 to 300,000 gallons a day. The water is not treated.

Swansboro, in Onslow County, obtains water from a drilled well 189 feet deep which yields 250 gallons a minute. The well is cased to 90.5 feet, and the hole is open below that depth, the water being obtained from shell rock in the Duplin marl. Consumption is estimated to average 20,000 to 25,000 gallons a day. The water is not treated.

Vass, in Moore County, obtains its water from a well 250 feet deep ending in the slate and schist unit. The well yields about 30 gallons a minute.

Wallace, in Duplin County, obtains water from a drilled well, 150 feet deep and 10 inches in diameter. The well is screened in sand of the Black Creek Formation and yields about 100 gallons a minute.

Warsaw, in Duplin County, obtains water from three wells ranging in depth from 77 to 120 feet. The wells are 8 inches in diameter and are screened in sand of the Black Creek Formation. Yields range from 40 to 80 gallons a minute. The water has a hardness of about 94 parts per million and is not treated. About 75,000 gallons are used daily.

Wrightsville Beach, in New Hanover County, obtains water from three wells ranging in depth from 160 to 176 feet and in yield from 150 to 300 gallons a minute. The casing in each well is set in shell rock of the Castle Hayne marl at depths of 125 to 146 feet, and the remainder of the hole is open. The water has a hardness of about 185 parts per million and a chloride content of 92 to 186 parts per million.

Federal and privately-owned water supplies in the Coastal Plain area

Bluethenthal Field, Wilmington Airport, New Hanover County, obtains water from three drilled wells, 96 to 105 feet and yielding water from shell rock in

the Peedee Formation. The tested yields ranged from 211 to 343 gallons a minute with drawdowns ranging from 6 to 25 feet.

Camp Davis, Onslow County, obtains its water from fourteen wells 8 inches in diameter, ranging in depth from 175 to 183 feet and tested at yields of 220 gallons a minute each with drawdowns ranging from 2 to 20 feet. Treatment consists of aeration over coke.

Camp Lejeune (presently known as New River Marine Base), Onslow County, obtains its water supply in the main barracks area from 21 drilled wells, averaging 167 feet deep and yielding an average of 220 gallons per minute. Most of these wells are gravel-walled. Many other wells, ranging from about 60 to 452 feet in depth, have been drilled at various other places on the reservation.

Fort Caswell, Brunswick County, obtains water from four wells, about 125 feet deep, at the corners of an area about 300 feet square. The four wells are pumped by a suction pump at a centrally-located pump house and together yield about 200 gallons a minute.

Fort Fisher, New Hanover County, obtains water from five drilled wells ranging in depth from 135 to 207 feet, with an average yield of about 250 gallons a minute. The wells end in shell rock of the Castle Hayne marl.

CHAPTER VIII - QUALITY OF WATER

Public Water-Supplies - Descriptions and chemical character of public supplies of water, both surface water and ground water, are contained in Chapter II of this publication.

Chemical Character of Surface Waters - The following material, taken from Bulletin 52, Volumes 1-10, inclusive, published by the North Carolina Department of Conservation and Development and prepared cooperatively by the Geological Survey, U. S. Department of the Interior, comprises analyses of samples of surface waters in the Cape Fear River Basin, collected, during the period from October 1, 1944 to September 30, 1954, daily for some stations, and monthly for other stations, at or near points where continuous stream-measurement stations were maintained. In addition to the daily and monthly samples, samples were also collected periodically at miscellaneous stream-measurement sites. This additional data made it possible to predict the chemical character of the stream at various points within the Cape Fear River Basin.

Alamance Creek at Alamance, Alamance County

	11-21-49	4-14-50	8-23-50	6-4-51	9-8-52	4-28-54	9-2-54	9-28-54
Mean discharge, c.f.s.	60.8	56.6	18.3	13.3	31.7	58.0	6.39	.454
Color	8							
pH	6.8	6.9	7.1	6.7	7.1	6.8	6.5	
Specific conductance	106	129	193	36.6	132	103	113	
Silica	21							
Iron	.03							
Calcium	7.2						8.0	
Magnesium	3.3						2.9	
Na + K	8.7							
Bicarbonate	42	49	60	60	38	44	39	60
Sulfate	4.9	4	5	3	7	4	15	16
Chloride	7.5	12	25	16	14	6.5	10	198
Fluoride	.1							
Nitrate	.1						2.4	
Dissolved solids	76							
Total hardness	32	37	39	44	32	34	32	99

Alamance Creek near Graham, Alamance County

	April 20, 1949		
Color	5	Bicarbonate	36
pH	6.8	Sulfate	4.6
Specific conductance	78.6	Chloride	3.9
Silica	15	Fluoride	.0
Iron	.01	Nitrate	.5
Calcium	5.8	Dissolved solids	59
Magnesium	.3	Total hardness	16
Na + K	11		

Back Creek near Haw River, Alamance County

	10-12-50	7-12-51	9-2-51	7-2-54
Discharge, c.f.s.	8.65	4.82	5.50	1.50
Color	8			
pH	7.2	6.9	6.9	6.9
Specific conductance	96.5	111	115	99.5
Silica	21			
Iron	.13			
Calcium	5.8			
Magnesium	3.2			
Na + K	10			
Bicarbonate	50	58	60	52
Sulfate	3.0	4	2	3
Chloride	4.2	4.0	3.5	4.5
Fluoride	.0			
Nitrate	.1			
Dissolved solids	72			
Total hardness	28	40	42	31

Bear Creek near Goldston, Chatham County

	11-22-49	4-16-50	8-25-50	6-3-51	9-8-52	4-24-53	8-27-53	9-24-53
Discharge, c.f.s.	5.38	5.50	4.52	0.573	3.23	7.32	.49	.009
Color	7							
pH	7.5	6.6	6.6	6.9	6.6	6.8	6.3	6.3
Specific conductance	72.5	82.8	55.4	86.8	57.4	65.3	44.7	68.3
Silica	16							
Iron	.14							
Calcium	5.2							
Magnesium	2.2							
Na + K	8.1							
Bicarbonate	28	32	20	35	18	27	16	26
Sulfate	3.4	2	3	2	3	3	5	4
Chloride	9.2	4.8	4.2	8.2	4.2	6.5	3.0	4.0
Fluoride	0							
Nitrate	.2							
Dissolved solids	58							
Total hardness	22	25	17	26	19	18	3	22

Bear Creek at Robbins, Moore County

	March 20, 1947		
Mean discharge, c.f.s.	299	Bicarbonate	20
Color	27	Sulfate	2.6
pH	7.0	Chloride	3.8
Silica	7.9	Fluoride	0.0
Iron	0.04	Nitrate	0.2
Calcium	3.2	Dissolved solids	41
Magnesium	1.4	Total hardness	14
Na + K	5.0		

Big Coharie Creek near Ingold, Sampson County

	March 22, 1947		
Mean discharge, c.f.s.		Bicarbonate	8.0
Color	54	Sulfate	3.9

Big Coharie Creek near Ingold (continued)

pH	5.55	Chloride	5.4
Silica	3.8	Fluoride	.0
Iron	.02	Nitrate	.2
Calcium	1.8	Dissolved solids	36
Magnesium	1.0	Total hardness	9
Na + K	4.5		

Big Rockfish Creek near Hope Mills, Cumberland County

	11-9-44	3-21-47
Discharge, c.f.s.	193	- -
Suspended matter	6	
Color	26	30
Silica	4.4	2.7
Iron	.04	.02
Calcium	.4	.9
Magnesium	.4	.5
Na + K	3.4	3.0
Bicarbonate	6.0	6.0
Sulfate	1.3	1.9
Chloride	2.5	2.5
Fluoride	.0	.0
Nitrate	.3	.4
Dissolved solids	19	21
Total hardness	3	4
pH		5.45

Black River near Atkinson, Pender County

	10-5-49	4-11-50	10-10-50
Discharge, c.f.s.	493	647	- -
Color	45	33	90
pH	5.8	5.8	5.9
Specific conductance	42.1	45.9	41.5
Silica	8.8	5.0	6.5
Iron	.10	.06	.27
Calcium	1.7	3.0	3.2
Magnesium	.7	1.0	.9
Na + K	6.8	4.3	7.4
Bicarbonate	10	11	20
Sulfate	3.7	3.0	3.8
Chloride	5.8	5.9	5.0
Fluoride	.1	.0	.0
Nitrate	.4	.6	.5
Dissolved solids	4	40	48
Total hardness	7	12	12

Black River at Clear Run, Sampson County

March 21, 1947

Color	57	Bicarbonate	6.0
pH	5.95	Sulfate	4.2
Silica	3.9	Chloride	4.9
Iron	.02	Fluoride	.0
Calcium	2.0	Nitrate	.2
Magnesium	.9	Dissolved solids	38
Na + K	3.5	Total hardness	9

Black River near Tomahawk, Sampson County

	8-3-51	8-18-51	9-10-51
Discharge, c.f.s.	466	801	108
Color	80		
pH	5.5	5.7	6.3
Specific conductance	54.6	44.9	53.6
Silica	12		
Iron	.19		
Calcium	3.0		
Magnesium	1.0		
Na + K	5.3		
Bicarbonate	7	7	11
Sulfate	8.6	3	3
Chloride	5.8	5.2	5.2
Fluoride	.0		
Nitrate	.4		
Dissolved solids	63		
Total hardness	12	9	14

Bonnie Doone, Kornbou, and Glenville Lakes at Fayetteville, Cumberland County

April 28, 1948

Suspended matter	21	Bicarbonate	7
Color	9	Sulfate	1.9
pH	6.6	Chloride	3.5
Silica	2.5	Fluoride	.1
Iron	.01	Nitrate	.5
Calcium	.8	Dissolved solids	21
Magnesium	.5	Total hardness	4
Na + K	4.3		

Brush Creek near Coleridge, Randolph County

	7-15-54	8-27-54	9-9-54
Instantaneous discharge, c.f.s.	1.37	.46	1.01
Silica	8.4		
Iron	.01		
Calcium	6.4		5.6
Magnesium	2.0		1.5
Na + K	6.1		
Bicarbonate	35	31	27
Sulfate	3.3	2	2
Chloride	4.0	3.0	3.5
Fluoride	.1		
Nitrate	1.4		1.3
Dissolved solids	54		
Hardness	24	20	20
Specific conductance	80.0	65.1	64.7
pH	6.2	7.0	6.5
Color	20		

Buckhorn Creek near Corinth, Chatham County

	4-19-50	8-11-50
Mean discharge, c.f.s.	19.8	5.00
Color		7
ph	7.3	7.1

Buckhorn Creek near Corinth, Chatham County (continued)

Specific conductance	78.6	58.3
Silica		18
Iron		.33
Calcium		3.6
Magnesium		1.0
Na + K		7.6
Bicarbonate	35	24
Sulfate	3	2.1
Chloride	6.2	5.2
Fluoride		0.1
Nitrate		0.3
Dissolved solids		54
Total hardness	20	13

Buffalo Creek near Greensboro, Guilford County

	March 20, 1947		
Mean discharge, c.f.s.	34	Na + K	9.0
Color	32	Bicarbonate	12
pH	4.7	Sulfate	24
Silica	23	Chloride	.9
Iron	.30	Nitrate	.9
Calcium	12	Dissolved solids	160
Magnesium	4.7	Total hardness	49

Cane Creek near Carrboro, Orange County

	8-12-54	9-1-54	9-21-54
Instantaneous discharge, c.f.s.	102	1.05	.756
Silica		9.5	
Iron		.05	
Calcium		5.7	
Magnesium		2.6	
Na + K		5.4	
Bicarbonate	34	35	38
Sulfate	1	3.9	2
Chloride	3.0	2.5	3.5
Fluoride		.1	
Nitrate		1.3	
Dissolved solids		53	
Hardness	21	25	25
Specific conductance	69.7	76.4	79.5
pH	6.9	7.0	6.9
Color		15	

Cape Fear River near Buckhorn, Lee County

	January 8, 1952		
Silica	17	Fluoride	.5
Iron	.03	Nitrate	1.0
Calcium	5.8	Dissolved solids	78
Magnesium	2.3	Total hardness	24
Na + K	13	Specific conductance	111
Bicarbonate	27	pH	6.8
Sulfate	13	Color	60
Chloride	9.8		

Cape Fear River at Elizabethtown, Bladen County

	March 21, 1947		
Color	30	Bicarbonate	9.0
pH	6.45	Sulfate	6.2
Silica	5.7	Chloride	4.5
Iron	.02	Fluoride	.0
Calcium	2.6	Nitrate	.5
Magnesium	1.2	Dissolved solids	42
Na + K	4.2	Total hardness	11

Cape Fear River near Fayetteville, Cumberland County

	March 19, 1946		
Color	28	Sulfate	3.8
Silica	7.4	Chloride	5.0
Iron	.03	Fluoride	.1
Calcium	3.0	Nitrate	.3
Magnesium	1.4	Dissolved solids	43
Na + K	6.0	Total hardness	13
Bicarbonate	18		

Cape Fear River near Kelly, Bladen County

	4-11-50	10-10-50
Discharge, c.f.s.	2,930	- -
Color	8	26
pH	6.2	6.7
Specific conductance	70.1	69.2
Silica	9.1	9.4
Iron	0.20	.15
Calcium	3.2	4.0
Magnesium	1.5	1.4
Na + K	9.1	7.2
Bicarbonate	22	18
Sulfate	6.1	5.8
Chloride	5.9	7.2
Fluoride	0.2	.1
Nitrate	0.8	.4
Dissolved solids	48	54
Total hardness	14	16

Cape Fear River at Lillington, Harnett County

	Average of daily samples, 10-1-44 to 9-30-45, incl.	3-20-47	6-9-49
Mean discharge, c.f.s.	4,534	3,610	
Temperature	62		
Suspended matter	29		
Oxygen consumed			
Unfiltered	6.2		
Filtered	5.0		
Color	28	15	8
Silica	11	7.7	7.1
Iron	.07	.02	.01
Calcium	5.0	4.3	5.8
Magnesium	2.0	1.8	2.3

Cape Fear River at Lillington, Harnett County (Continued)

Na + K	9.0	5.9	12
Bicarbonate	30	20	39
Sulfate	5.8	5.5	6.4
Chloride	6.0	5.6	7.0
Fluoride	.1	.2	.4
Nitrate	.7	.6	.5
Dissolved solids	63	50	66
Total hardness	21	18	24
pH		6.85	7.1
Specific conductance			104

Cape Fear River at Lock 3, near Tarheel, Bladen County

	11-4-44	Average of daily samples 10-1-46 to 9-30-47, incl.	4-16-52
Mean discharge, c.f.s.	1,700	4,232	2,990
Suspended matter	5	24	
Color	35	37	28
Silica	10	7.6	7.8
Iron	.32	.05	.24
Calcium	2.8	3.3	4.8
Magnesium	1.4	1.5	1.1
Na + K	5.1	6.9	6.9
Bicarbonate	14	18	20
Sulfate	4.7	5.0	5.4
Chloride	4.9	6.0	5.8
Fluoride	.0	.2	.1
Nitrate	.8	.8	.9
Dissolved solids	46	48	51
Total hardness	13	14	16
Temperature		64	
Oxygen consumed			
Unfiltered		7.6	
Filtered		5.8	
pH		6.6	7.0
Specific conductance			57.1

Cape Fear River at Wilmington, New Hanover County

	March 27, 1947		
Color	77	Bicarbonate	11
pH	6.95	Sulfate	5.3
Silica	3.4	Chloride	6.2
Iron	.01	Fluoride	.0
Calcium	4.0	Nitrate	.4
Magnesium	1.2	Dissolved solids	50
Na + K	4.0	Total hardness	15

Colly Creek near Kelly, Bladen County

	12-12-49	1-17-50	2-16-50	4-16-50	6-24-50	8-9-50
Mean discharge, c.f.s.	36.3	97.7	71.4	31.5	5.29	167
Color	180					
pH	4.5	4.4	4.4	4.6	4.6	4.3
Specific conductance	40.8	49.6	42.7	38.3	42.2	42.2

Colly Creek near Kelly, Bladen County (continued)

Silica	12					
Iron	0.26					
Calcium	2.4					
Magnesium	1.2					
Na + K	1.9					
Bicarbonate	6	1	1	2	3	0
Sulfate	2.3	3	2	1	4	2
Chloride	5.2	7.8	6.8	4.5	5.5	5.0
Fluoride	.0					
Nitrate	.5					
Dissolved solids	86					
Total hardness	11	14	14	7	9	9

Crane Creek near Vass, Moore County

	8-11-49	4-24-50	8-22-50	5-28-51	9-14-51	9-10-52	10-30-52	4-30-53	4-13-54
Mean discharge c.f.s.	8.01	13.7	8.06	1.70		40.5	3.58	16.2	16.8
Color	13								
pH	6.3	6.5	6.7	6.6	5.9	6.4	6.6	6.2	5.7
Specific conductance	36.4	39.6	36.5	45.3	117	29.1	43.4	84.7	26.4
Silica	11								
Iron	.03								
Calcium	2.4								
Magnesium	.8								
Na + K	3.7								
Bicarbonate	11	15	11	19	51	8	16	12	4
Sulfate	2.3	1	2	1	1	1	2	1	3
Chloride	3.9	3.0	3.5	3.5	9.5	3.5	4.0	4.0	3.5
Fluoride	.1								
Nitrate	.3								
Dissolved solids	35								
Total hardness	9	18	10	13	37	8	15	36	4

Deep River at Moncure, Chatham County

	March 20, 1947		
Color	20	Bicarbonate	21
pH	7.05	Sulfate	6.3
Silica	9.3	Chloride	5.2
Iron	.03	Fluoride	.1
Calcium	3.8	Nitrate	.3
Magnesium	1.8	Dissolved solids	49
Na + K	6.8	Total hardness	17

Deep River at Ramseur, Randolph County

	11-2-44	Average of daily samples, 10-1-46 to 9-30-47, incl.
Mean discharge, c.f.s.	106	270
Suspended matter	10	41
Color	44	20

Deep River at Ramseur, Randolph County (continued)

Silica	16	14
Iron	.05	.04
Calcium	6.0	7.4
Magnesium	2.6	2.9
Na + K	7.6	15
Bicarbonate	31	41
Sulfate	6.9	7.1
Chloride	5.8	15
Fluoride	.0	.1
Nitrate	1.8	1.4
Dissolved solids	74	91
Total hardness	26	30
Temperature		61
Oxygen consumed		
Unfiltered		5.2
Filtered		3.8
pH		6.85

Deep River near Randleman, Randolph County

	March 20, 1947		
Mean discharge, c.f.s.	104	Bicarbonate	37
Color	17	Sulfate	10
pH	7.0	Chloride	16
Silica	15	Fluoride	.0
Iron	.02	Nitrate	.7
Calcium	6.8	Dissolved solids	87
Magnesium	3.0	Total hardness	29
Na + K	16		

Deep River near Sanford, Lee County

	January 8, 1952	
	Bridge on U. S. Highway 421	Bridge on U. S. Highway 15
Silica	16	15
Iron	.04	.14
Calcium	6.3	5.2
Magnesium	1.7	2.2
Na + K	9.2	8.1
Bicarbonate	27	28
Sulfate	8.1	3.4
Chloride	7.8	9.2
Fluoride	.1	.0
Nitrate	1.2	.2
Dissolved solids	62	58
Total hardness	23	22
Specific conductance	102	72.5
pH	7.1	7.5
Color	80	7

Deep River at Worthville, Randolph County

	July 12, 1946		
Color	20	Sulfate	6.7
Silica	13	Chloride	14
Iron	.02	Fluoride	.1

Deep River at Worthville, Randolph County (continued)

Calcium	7.8	Nitrate	2.4
Magnesium	2.9	Dissolved solids	88
Na + K	12	Total hardness	31
Bicarbonate	35		

East Fork Deep River near High Point, Guilford County

	March 20, 1947		
Mean discharge, c.f.s.	12	Bicarbonate	38
Color	15	Sulfate	4.3
pH	7.6	Chloride	2.5
Silica	9.6	Fluoride	.0
Iron	.02	Nitrate	.2
Calcium	6.5	Dissolved solids	64
Magnesium	3.0	Total hardness	29
Na + K	5.0		

Fork Creek near Coleridge, Randolph County

	7-15-54	8-27-54	9-9-54
Instantaneous discharge, c.f.s.	1.14	.66	.35
Silica	18		
Iron	.15		
Calcium	5.9		5.6
Magnesium	1.3		1.5
Na + K	7.8		
Bicarbonate	36	26	25
Sulfate	2.4	3	20
Chloride	3.5	3.0	3.0
Fluoride	.0		
Nitrate	.1		3.7
Dissolved solids	64		
Hardness	20	17	20
Specific conductance	77.0	58.1	67.2
pH	7.0	6.8	6.2
Color	8		

Haw River near Benaja, Rockingham County

	8-19-46	3-20-47	4-20-49	Average of daily samples, 10-1-52 to 9-30-53, incl.
Mean discharge, c.f.s.	25	167	139	137
Suspended matter	16			17
Color	3	10	4	14
pH		7.3	6.4	6.8
Silica	23	13	16	18
Iron	.02	.02	.20	0.08
Calcium	6.0	3.8	5.0	5.5
Magnesium	2.2	1.7	1.9	2.0
Na + K	7.2	5.2	5.7	6.2
Bicarbonate	40	24	32	30
Sulfate	1.7	4.1	2.3	4.3
Chloride	2.9	2.5	2.5	3.4
Fluoride	.2	.1	.1	0.2
Nitrate	.5	.2	.4	1.1
Dissolved solids	72	45	52	61

Haw River near Benaja, Rockingham County (continued)

Total hardness	24	16	20	22
Specific conductance			62.1	75.1
Temperature				60
Oxygen consumed				
Unfiltered				4.7
Filtered				3.5

Haw River near Burlington, Alamance County

	October 9, 1953
Bicarbonate	36
Sulfate	2
Chloride	2.0
Hardness	23
Specific conductance	83.4
pH	7.0

Haw River at Haw River, Alamance County

	3-20-47	4-20-49
Mean discharge, c.f.s.	653	378
Color	16	4
pH	7.2	6.6
Silica	12	17
Iron	.03	.01
Calcium	5.2	5.8
Magnesium	2.2	.3
Na + K	7.9	15
Bicarbonate	28	34
Sulfate	9.4	7.2
Chloride	4.2	5.8
Fluoride	.1	1.0
Nitrate	.4	2.0
Dissolved solids	64	72
Total hardness	22	16
Specific conductance		100

Haw River near Moncure, Chatham County

	October 11, 1945		
Suspended matter	11	Bicarbonate	37
Color	24	Sulfate	8.6
pH	6.7	Chloride	7.1
Silica	15	Fluoride	.3
Iron	.03	Nitrate	2.0
Calcium	6.6	Dissolved solids	80
Magnesium	2.7	Total hardness	28
Na + K	11		

Haw River near Pittsboro, Chatham County

	10-19-44	3-20-47	2-17-54	9-7-54
Mean discharge, c.f.s.	286	1,270	612	25
Suspended matter	6			
Color	17	15	19	19
Silica	16	12	17	1.9

Haw River near Pittsboro, Chatham County (continued)

Iron	.02	.02	.06	.01
Calcium	5.8	4.5	7.5	8.7
Magnesium	2.4	2.1	2.6	2.5
Na + K	21	8.3	29	94.4
Bicarbonate	54	29	48	139
Sulfate	9.5	6.4	26	31
Chloride	11	4.8	16	50
Fluoride	.3	.3	.7	2.9
Nitrate	.3	.4	2.8	2.6
Dissolved solids	95	54	130	278
Total hardness	24	20	29	32
pH		7.6	6.8	7.6
Specific conductance			201	464

Haw River near Summerfield, Guilford County

	6-5-51	9-5-51	9-5-52	8-11-53	9-9-53	9-8-54
Discharge, c.f.s..	4.33	1.40	6.45	2.74	4.93	.844
Color						17
pH	6.8	6.9	6.9	7.5	6.7	6.8
Specific conductance	71.5	74.4	65.6	70.2	61.1	67.6
Silica						17
Iron						0.19
Calcium						5.0
Magnesium						1.9
Na + K						6.3
Bicarbonate	35	39	34	36	29	33
Sulfate	2	1	2	1	3	3.7
Chloride	3.0	2.5	2.2	2.8	2.5	2.0
Fluoride						0.1
Nitrate						0.6
Dissolved solids						59
Total hardness	24	24	22	19	18	21

Hood Creek near Leland, Brunswick County

	5-25-50	8-17-50	5-23-51	10-1-51	10-31-51	9-10-52	10-29-52	5-30-53	9-16-54
Mean discharge, c.f.s.	1.67	3.00	0.69	6.30	.87	.26	6.79	.050	.067
Color	40								
pH	6.5	6.7	6.2	6.3	6.7	6.7	6.5	6.8	7.0
Specific conductance	95.0	73.9	98.2	60.3	103	108	68.0	139	151
Silica	6.7								
Iron	.08								
Calcium	13								24
Magnesium	2.0								.7
Na + K	2.5								
Bicarbonate	40	30	48	20	46	44	20	66	75
Sulfate	2.3	1	1	1	1	2	2	2	2
Chloride	7.5	5.2	6.5	6.2	6.8	7.5	7.5	7.0	6.5
Fluoride	.0								
Nitrate	.4								.3

Hood Creek near Leland, Brunswick County (continued)

Dissolved solids	65								
Total hardness	41	30	37	22	43	44	24	52	63

Horspen Creek at Battle Ground, Guilford County

	March 20, 1947		
Mean discharge, c.f.s.	13	Bicarbonate	41
Color	5	Sulfate	8.3
pH	7.1	Chloride	3.4
Silica	16	Fluoride	.1
Iron	.04	Nitrate	.8
Calcium	6.8	Dissolved solids	71
Magnesium	3.1	Total hardness	30
Na + K	8.4		

Jordan Creek near Union Ridge, Alamance County

	11-21-49	8-23-50	7-12-51
Mean discharge, c.f.s.	6.05	0.80	0.368
Color	8		
pH	6.9	7.0	7.1
Specific conductance	105	111	105
Silica	26		
Iron	.03		
Calcium	6.9		
Magnesium	3.5		
Na + K	10		
Bicarbonate	50	59	52
Sulfate	5.3	3	4
Chloride	4.8	4.2	4.0
Fluoride	.1		
Nitrate	.1		
Dissolved solids	83		
Total hardness	32	37	32

Little Alamance Creek near Whitsett, Guilford County

	8-23-50	9-12-50	11-30-50	6-4-51	9-4-51	9-8-52	4-28-53	9-2-54	9-22-54
Mean disharge, c.f.s.	5.60	4.27	9.76	3.36	2.22	7.09	14.0	2.68	.709
Color	7								
pH	7.5	6.8	6.6	6.7	7.0	6.5	6.4	6.7	7.3
Specific conductance	114	121	109	120	128	92.7	100	97.3	130
Silica	26								
Iron	.15								
Calcium	9.7							7.6	
Magnesium	4.0							2.9	
Na + K	8.0								
Bicarbonate	59	60	52	58	65	45	47	42	67
Sulfate	2.4	4	5	2	3	3	2	7	4
Chloride	5.0	5.5	4.8	4.8	5.2	4.2	5.0	4.8	6.5
Fluoride	.0								

Little Alamance Creek near Whitsett, Guilford County (continued)

Nitrate	.43							2.1	
Dissolved solids	85								
Total hardness	14	42	37	40	45	32	34	31	47

Little Coharie Creek near Ingold, Sampson County

	March 22, 1947		
Color	57	Bicarbonate	8.0
pH	5.3	Sulfate	3.3
Silica	5.4	Chloride	2.4
Iron	.02	Fluoride	.0
Calcium	1.7	Nitrate	.2
Magnesium	1.1	Dissolved solids	37
Na + K	2.2	Total hardness	9

Little Coharie Creek at Roseboro, Sampson County

	6-22-49	12-12-49	2-16-50	4-15-50	8-8-50
Mean discharge, c.f.s.	51.3	37.8	45.1	26.1	26.9
Color	80				
pH	5.1	6.2	6.1	5.8	5.7
Specific conductance	35.6	37.1	38.6	38.1	40.6
Silica	6.9				
Iron	.18				
Calcium	2.0				
Magnesium	.5				
Na + K	3.6				
Bicarbonate	3	6	6	7	5
Sulfate	3.3	2	2	2	1
Chloride	5.9	6.5	7.0	6.0	6.0
Fluoride	.1				
Nitrate	.6				
Dissolved solids	48				
Total hardness	7	4	5	5	7

Little River at Lakeview, Moore County

	August 31, 1948		
Color	16	Bicarbonate	5
pH	5.8	Sulfate	1.6
Silica	8.8	Chloride	3.1
Iron	.02	Fluoride	.2
Calcium	1.9	Nitrate	.4
Magnesium	.7	Dissolved solids	26
Na + K	1.5	Total hardness	8

Little River near Sanford, Lee County

	January 8, 1952		
Silica	13	Fluoride	.1
Iron	.10	Nitrate	.1
Calcium	2.2	Dissolved solids	48
Magnesium	1.0	Total hardness	10
Na + K	8.6	Specific conductance	55.5
Bicarbonate	10	pH	6.7

Little River near Sanford, Lee County (continued)

Sulfate	7.2	Color	30
Chloride	8.6		

Little River at Vass, Moore County

	August 30, 1948		
Color	22	Bicarbonate	6
pH	5.8	Sulfate	1.5
Silica	4.6	Chloride	2.5
Iron	.27	Fluoride	.0
Calcium	.8	Nitrate	.3
Magnesium	.4	Dissolved solids	27
Na + K	3.0	Total hardness	4
		Suspended matter	2

Little Rock Fish Creek near Hope Mills, Cumberland County

	11-9-44	3-21-47
Mean discharge, c.f.s.	148	
Suspended matter	13	
Color	28	17
Silica	4.6	2.8
Iron	.19	.01
Calcium	.6	1.2
Magnesium	.5	.7
Na + K	3.8	3.3
Bicarbonate	7.0	7.0
Sulfate	1.7	2.2
Chloride	2.9	3.0
Fluoride	.0	.1
Nitrate	.3	.7
Dissolved solids	22	20
Total hardness	4	6
pH		5.75

Livingston Creek near Acme, Columbus County

	9-28-50	5-23-51	10-1-51	10-31-51	9-10-52	10-29-52	5-31-53	8-26-54
Mean discharge, c.f.s.	30.0	4.62	8.85	1.25	15.0	25.1	.49	.385
Color	65							
pH	6.7	7.1	6.7	7.2	6.9	6.6	7.0	7.8
Specific conductance	94.2	171	154	176	96.2	107	196	179
Silica	8.0							
Iron	.33							
Calcium	13							
Magnesium	1.1							
Na + K	0.3							
Bicarbonate	7.4	68	67	79	27	34	81	79
Chloride	7.2	12	8	8	5	7	10	10
Fluoride	0.0	8.2	7.0	7.8	8.4	8.5	9.0	7.5
Nitrate	0.2							
Dissolved solids	81							
Total hardness	37	71	67	76	34	39	88	75

Lower Little River near Lillington, Harnett County

	September 8, 1952
Bicarbonate	8
Sulfate	2
Chloride	4.5
Total hardness	8
Specific conductance	33.2
pH	6.6

Lower Little River at Linden, Harnett County

	11-10-44	Average of daily samples 10-1-46 to 9-30-47, incl.
Mean discharge, c.f.s.	346	506
Suspended matter	2	16
Color	34	35
Silica	5.5	4.7
Iron	.01	.03
Calcium	1.0	1.6
Magnesium	.6	.7
Na + K	4.1	3.3
Bicarbonate	7.0	6.0
Sulfate	2.1	2.9
Chloride	2.9	3.6
Fluoride	.0	.1
Nitrate	2.2	.7
Dissolved solids	28	30
Total hardness	5	7
Temperature		62
Oxygen consumed		
Unfiltered		8.1
Filtered		6.1
pH		5.9

Lower Little River at Manchester, Cumberland County

	8-5-46	3-20-47
Mean discharge, c.f.s.	454	644
Suspended matter	11	
Color		27
pH		5.75
Silica	5.7	4.1
Iron	.02	.02
Calcium	1.1	1.6
Magnesium	.6	.8
Na + K	2.3	1.8
Bicarbonate	5.0	5.0
Sulfate	1.6	2.9
Chloride	2.8	2.8
Fluoride	.0	.0
Nitrate	.6	.2
Dissolved solids	27	25
Total hardness	5	7

McLendons Creek near Carthage, Moore County

	8-11-49	4-24-50	8-22-50	5-29-51	8-14-51	9-10-52
Mean discharge, c.f.s.	1.91	16.6	6.77	3.18	7.75	44.6
Color	17					
pH	6.1	6.1	6.1	6.5	6.2	6.1
Specific conductance	20.9	25.9	22.5	28.1	25.6	21.3
Silica	6.9					
Iron	.05					
Calcium	2.6					
Magnesium	1.0					
Na + K	0.0					
Bicarbonate	6	10	8	10	7	6
Sulfate	2.1	1	1	6	1	1
Chloride	2.2	2.8	2.5	2.8	2.2	2.2
Fluoride	0.1					
Nitrate	.3					
Dissolved solids	29					
Total hardness	11	9	5	7	6	6

McLendons Creek near Carthage, Moore County (continued)

	10-28-52	4-29-53	8-27-53	4-13-54
Mean discharge, c.f.s.	10.0	24.7	0.22	48.2
Color				
pH	6.3	6.3	6.0	6.2
Specific conductance	24.6	24.1	25.7	22.0
Silica				
Iron				
Calcium				
Magnesium				
Na + K				
Bicarbonate	9	8	8	5
Sulfate	1	1	2	2
Chloride	2.2	2.5	2.8	2.8
Fluoride				
Nitrate				
Dissolved solids				
Total hardness	10	10	5	4

Moores Creek near Atkinson, Pender County

	6-23-49	12-12-49	4-16-50	9-29-50
Mean discharge, c.f.s.	28.3	3.10	6.22	2.76
Color	90			
pH	5.5	5.5	6.0	5.1
Specific conductance	28.5	38.2	40.5	34.9
Silica	6.6			
Iron	.26			
Calcium	3.0			
Magnesium	.7			
Na + K	.6			
Bicarbonate	5	3	8	6
Sulfate	1.7	3	1	1
Chloride	4.1	7.2	7.2	6.0
Fluoride	.0			
Nitrate	.2			
Dissolved solids	41			
Total hardness	10	7	10	6

Neill Creek near Lillington, Harnett County

	4-13-54	7-15-54
Instantaneous discharge, c.f.s.	45.2	.83
Bicarbonate	9	17
Sulfate	5	2
Chloride	5.2	3.0
Hardness	8	9
Specific conductance	46.3	52.1
Color	6.2	6.4

New Hope River near Durham, Durham County

	11-22-49	4-14-50	8-16-50	6-5-51	6-7-51	9-8-52
Discharge, c.f.s.	12.5	13.7	4.73	4.05	3.57	6.35
Color	4					
pH	6.2	6.7	6.6	6.4	6.2	6.1
Specific conductance	119	123	148	183	173	123
Silica	16					
Iron	.04					
Calcium	7.6					
Magnesium	2.9					
Na + K	9.3					
Bicarbonate	30	45	38	60	27	29
Sulfate	6.8	8	12	8	7	7
Chloride	7.5	8.0	9.8	10	11	6.5
Fluoride	.0					
Nitrate	11					
Dissolved solids	82					
Total hardness	31	38	41	41	22	35

New Hope River near Durham, Durham County (continued)

	10-29-52	4-24-53	8-28-53	6-30-54	9-9-54
Discharge, c.f.s.	3.09	24.6	1.30	1.66	1.11
Color					
pH	6.6	6.8	7.0	6.7	6.5
Specific conductance	202	104	357	209	328
Silica					
Iron					
Calcium					18
Magnesium					4.9
Na + K					
Bicarbonate	56	37	94	60	59
Sulfate	7	6	28	16	23
Chloride	14	6.8	28	18	30
Fluoride					
Nitrate					12
Dissolved solids					
Total hardness	50	30	68	44	66

New Hope River near Merry Oaks, Chatham County

	March 20, 1947		
Color	15	Bicarbonate	20
pH	6.8	Sulfate	2.6
Silica	11	Chloride	3.8
Iron	.02	Fluoride	0.0
Calcium	5.1	Nitrate	0.2

New Hope Creek near Merry Oaks, (continued)

Magnesium	2.1	Dissolved solids	41
Na + K	6.3	Total hardness	14

North Branch Rocky River near Staley, Randolph County

	April 14, 1954	April 20, 1954
Instaneous discharge, c.f.s.	6.08	.99
Bicarbonate	30	33
Sulfate	4	7
Chloride	4.5	4.8
Hardness	20	24
Specific conductance	72.9	83.5
pH	6.7	6.9

North Buffalo Creek near Greensboro, Guilford County

	10-23-44	3-20-47	2-18-54	8-18-54
Discharge, c.f.s.	32	46	27	46
Suspended matter	53			
Color	33	50		
Silica	14	11	21	9.8
Iron	.02	.15	.21	.17
Calcium	14	16	13	10
Magnesium	2.0	4.0	1.2	.1
Na + K	165	50	347	193
Bicarbonate	307	125	554	422
Sulfate	46	32	268	49
Chloride	73	23	79	34
Fluoride	.0	.2	.0	.2
Nitrate	.2	.3	.5	.5
Dissolved solids	466	256	1,000	554
Total hardness	43	60	37	26
pH		7.1	10.1	9.3
Specific conductance			1,650	817

Northeast Cape Fear River near Castle Hayne, New Hanover County

	8-8-46	3-21-47	Average of daily samples, 10-1-50 to 9-30-51, incl.
Mean discharge, c.f.s.	1,440		279
Suspended matter	8		4
Color	155	110	60
pH		5.9	6.4
Silica	6.6	2.5	8.5
Iron	.02	.02	0.20
Calcium	3.8	4.2	6.6
Magnesium	1.0	1.0	1.2
Na + K	3.6	3.7	12
Bicarbonate	10	10.0	19
Sulfate	3.1	4.2	6.9
Chloride	6.8	6.9	17
Fluoride	.0	.1	0.0
Nitrate	.4	.2	0.3
Dissolved solids	58	55	77
Total hardness	14	15	21
Temperature			62

Northeast Cape Fear River near Castle Hayne (continued)

Oxygen consumed	
Unfiltered	15
Filtered	11
Specific conductance	104

Polecat Creek near Climax, Guilford County

	4-14-54	8-25-54	9-17-54
Instantaneous discharge, c.f.s.	19.7	.35	.13
Silica			11
Iron			0.02
Calcium			9.0
Magnesium			3.6
Sodium			5.3
Potassium			3.5
Bicarbonate	34	44	50
Sulfate	5	5	4.9
Chloride	3.2	3.0	5.8
Fluoride			0.2
Nitrate			1.3
Dissolved solids			80
Hardness	4	32	37
Specific conductance	75.3	87.3	128
pH	7.0	6.8	6.6
Color			17

Reedy Fork near Gibsonville, Guilford and Alamance Counties

	10-23-44	3-20-47	Average of daily samples, 10-1-51 to 9-30-52, incl.
Discharge, c.f.s.	262	222	115
Suspended matter	31		35
Color	22	14	15
Silica	11	9.6	16
Iron	0.10	0.02	0.10
Calcium	3.6	4.2	5.4
Magnesium	1.6	1.6	2.1
Na + K	4.6	4.5	5.5
Bicarbonate	22	23	30
Sulfate	3.8	4.4	4.3
Chloride	2.2	2.2	2.8
Fluoride	0.1	0.1	0.7
Nitrate	0.2	0.1	0.4
Dissolved solids	46	44	56
Total hardness	16	17	22
pH			6.9
Temperature			64
Specific conductance			69.9
Oxygen consumed			
Unfiltered			3.4
Filtered			2.8

Richland Creek near Asheboro, Randolph County

	11-22-49	10-9-50	11-27-50	9-8-52	4-24-53	8-13-53	7-15-54	9-9-54
Discharge, c.f.s.	15.1	3.96	7.92	10.2	22.3	2.42	1.58	0.16
Color	5							
pH	7.8	6.6	6.6	6.6	6.9	6.9	7.0	6.8
Specific conductance	70.4	77.1	73.3	62.2	63.3	95.9	77.8	60.9
Silica	25							
Iron	.22							
Calcium	.3							5.2
Magnesium	2.1							1.2
Na + K	6.5							
Bicarbonate	35	40	37	26	32	38	41	23
Sulfate	1.9	4	1	3	1	10	2	2
Chloride	3.8	3.5	3.2	1.5	3.8	5.2	3.0	2.5
Fluoride	.0							
Nitrate	.0							2.9
Dissolved solids	62							
Total hardness	22	25	22	19	19	31	24	18

Rock Fish Creek near Wallace, Duplin County

March 21, 1947

Color	45	Bicarbonate	6.0
pH	6.5	Sulfate	4.8
Silica	3.3	Chloride	6.2
Iron	0.02	Fluoride	0.0
Calcium	3.0	Nitrate	0.4
Magnesium	0.9	Dissolved solids	40
Na + K	3.6	Total hardness	11

Rocky River near Pittsboro, Chatham County

March 20, 1947

Color	12	Bicarbonate	24
pH	7.2	Sulfate	3.5
Silica	6.0	Chloride	5.1
Iron	0.04	Fluoride	0.0
Calcium	4.5	Nitrate	0.2
Magnesium	2.0	Dissolved solids	44
Na + K	5.2	Total hardness	19

Sandy Creek near Liberty, Randolph County

	11-22-49	4-14-50	8-25-50	6-4-51	9-8-52	4-24-53	6-29-54	8-4-54
Discharge, c.f.s.	12.4	11.8	3.34	2.61	9.32	17.7	2.10	8.68
Color	3							
pH	7.6	6.7	7.1	7.0	6.7	6.7	6.6	6.9
Specific conductance	87.5	86.2	102	95.9	84.5	81.1	66.0	95.9
Silica	23							
Iron	0.06							
Calcium	6.6							
Magnesium	2.9							
Na + K	7.0							
Bicarbonate	43	44	48	45	40	38	30	38

Sandy Creek near Liberty, (continued)

Sulfate	2.7	2	2	2	3	2	4	3.8
Chloride	3.8	3.0	3.5	3.8	3.0	3.2	10	5.2
Fluoride	0.0							
Nitrate	0.1							
Dissolved solids	69							
Total hardness	28	31	31	30	32	26	20	31

Rockfish Creek near Raeford, Hoke County

	8-22-50	9-27-50	5-28-51	9-14-51	10-25-51
Discharge, c.f.s.	82.0	84.6	53.3	47.2	50.8
Color	9				
pH	5.3	5.8	5.8	5.8	5.8
Specific conductance	18.2	22.4	10.5	21.5	14.4
Silica	6.5				
Iron	.07				
Calcium	1.6				
Magnesium	.4				
Na + K	1.4				
Bicarbonate	4	6	4	5	5
Sulfate	1.8	1	2	1	1
Chloride	2.4	2.5	3.0	2.2	1.5
Nitrate	.3				
Fluoride	.0				
Dissolved solids	20				
Total hardness	6	4	1	8	4

Rockfish Creek near Raeford, (continued)

	9-8-52	10-28-52	4-29-53	8-31-53	7-15-54
Discharge, c.f.s.	71.1	64.3	87.0	41.1	41.7
Color					
pH	5.5	5.8	5.7	5.7	5.8
Specific conductance	12.9	13.5	13.3	15.9	10.9
Silica					
Iron					
Calcium					
Magnesium					
Na + K					
Bicarbonate	2	4	4	4	3
Sulfate	1	2	1	1	1
Chloride	2.2	2.0	2.2	2.2	2.0
Fluoride					
Nitrate					
Dissolved solids					
Total hardness	4	4	2	3	2

Six Runs near Clinton, Sampson County

	12-12-49	4-15-50	9-29-50	5-23-51	9-13-51
Discharge, c.f.s.	40.7	21.5	4.78	5.58	1.96
Color	8				
pH	6.1	6.4	6.5	6.5	6.6
Specific conductance	56.0	60.6	67.2	59.1	74.5

Six Runs near Clinton, (continued)

Silica	12				
Iron	0.16				
Calcium	3.1				
Magnesium	0.9				
Na + K	5.7				
Bicarbonate	14	18	17	18	24
Sulfate	3.5	2	6	5	3
Chloride	6.0	6.0	6.0	8.2	7.2
Fluoride	0.0				
Nitrate	0.4				
Dissolved solids	44				
Total hardness	11	8	14	16	22

Six Runs near Clinton (continued)

	9-10-52	10-30-52	4-21-53	8-26-53
Discharge, c.f.s.	2.50	3.27	39.0	0.28
Color				
pH	6.5	6.7	6.1	6.9
Specific conductance	75.6	71.2	59.2	117
Silica				
Iron				
Calcium				
Magnesium				
Na + K				
Bicarbonate	24	22	14	35
Sulfate	3	4	3	10
Chloride	7.2	6.5	7.0	5.0
Fluoride				
Nitrate				
Dissolved solids				
Total hardness	24	22	16	33

Six Runs near Delway, Sampson County

	March 22, 1947		
Color	54	Bicarbonate	8.0
pH	6.1	Sulfate	4.5
Silica	3.6	Chloride	5.0
Iron	0.02	Fluoride	0.0
Calcium	3.3	Nitrate	0.3
Magnesium	0.8	Dissolved solids	41
Na + K	3.2	Total hardness	12

South River near Parkersburg, Sampson County

	8-3-51	8-17-51	11-2-51	3-11-54	8-25-54
Discharge, c.f.s.	79.5	152	20.3	660	2.2
Color	65			64	90
pH	4.8	5.0	5.8	4.9	5.4
Specific conductance	40.9	54.8	42.7	51.6	278
Silica	10			1.5	7.1
Iron	0.07			0.22	0.20
Calcium	1.4			2.1	2.6
Magnesium	0.8			1.0	3.9
Na + K	5.5			4.8	46.1

South River near Parkersburg (continued)

Bicarbonate	5	4	5	2	4
Sulfate	5.9	5	1	6.9	15
Chloride	5.9	6.5	5.5	7.5	66
Fluoride	0.0			0.1	0.0
Nitrate	0.3			0.0	0.4
Dissolved solids	51			50	172
Total hardness	7	8	10	9	22

South River near Tomahawk, Sampson County

	March 21, 1947		
Color	91	Bicarbonate	5.0
pH	5.2	Sulfate	3.2
Silica	2.7	Chloride	5.0
Iron	0.02	Fluoride	0.0
Calcium	1.7	Nitrate	0.1
Magnesium	0.9	Dissolved solids	39
Na + K	3.0	Total hardness	8

Stoney Creek at Burlington, Alamance County

	March 30, 1948		
Suspended matter	27	Bicarbonate	38
Color	17	Sulfate	6.2
pH	7.2	Chloride	3.1
Silica	18	Fluoride	0.2
Iron	0.02	Nitrate	0.1
Calcium	6.6	Dissolved solids	64
Magnesium	3.1	Total hardness	29
Na + K	6.2		

Troublesome Creek near Reidsville, Rockingham County

	11-21-49	4-14-50	8-28-50	4-6-51	9-12-51
Discharge, c.f.s.	39.3	35.2	16.8	14.5	3.35
Color	7				
pH	6.7	7.3	6.9	7.0	7.1
Specific conductance	55.9	81.6	59.0	64.4	68.3
Silica	18				
Iron	0.02				
Calcium	4.4				
Magnesium	1.9				
Na + K	3.5				
Bicarbonate	24	45	30	31	36
Sulfate	3.1	3	1	1	2
Chloride	2.2	1.8	1.5	3.0	2.2
Fluoride	0.1				
Nitrate	0.2				
Dissolved solids	47				
Total hardness	19	28	18	20	23

Troublesome Creek near Reidsville (continued)

	11-30-50	9-9-52	8-11-53	9-10-53	3-11-54	8-10-54
Discharge, c.f.s.		18.9	4.61	4.23	27.7	2.66
Color	2					

Troublesome Creek near Reidsville (continued)

pH	7.3	6.8	7.2	6.5	6.9	7.0
Silica	18					
Iron	0.06					
Calcium	4.4					
Magnesium	1.9					
Na + K	2.8					
Bicarbonate	23	27	33	29	23	35
Sulfate	1.8	2	2	3	5	2
Chloride	0.2					
Nitrate	0.1					
Dissolved solids	48					
Total hardness	19	20	22	10	16	21
Specific conductance	57.2	55.1	64.6	61.5	52.6	68.1

Turnbull Creek near Elizabethtown, Bladen County

	6-22-49	12-12-49	4-16-50	9-28-50	5-23-51	11-1-51	9-9-52	5-31-53	8-25-53
Discharge c.f.s.	5.52	26.4	15.7	21.4	7.99	2.77	28.2	2.67	0.46
Color	380								
pH	4.3	4.5	4.5	4.2	4.3	5.2	4.1	4.6	6.0
Specific conductance	42.3	39.3	35.3	47.4	47.2	36.4	58.3	45.5	51.7
Silica	7.1								
Iron	0.39								
Calcium	2.0								
Magnesium	0.8								
Na + K	0.3								
Bicarbonate	0.0					4	4	1	7
Sulfate	2.8	0.0	2	0	0	1	1	1	7
Chloride	4.2	1	2	1	1	5.2	5.5	5.0	4.2
Fluoride	0.0	4.8	4.5	4.2	5.5				
Nitrate	0.2								
Dissolved solids	75								
Total hardness	8	4	6	3	5	6	4	7	8

Upper Little River near Lillington, Harnett County

	3-20-47	8-11-49	4-17-50	8-22-50	5-28-51	11-1-51
Discharge, c.f.s.		106	75.4	40.4	14.9	11.5
Color	30	27				
pH	6.2	6.0	6.4	6.4	7.3	6.2
Silica	5.3	9.4				
Iron	0.02	0.02				
Calcium	1.8	2.3				
Magnesium	0.9	0.6				
Na + K	3.6	3.2				
Bicarbonate	9.0	9.0	13	10	18	11
Sulfate	3.0	2.0	1	1	2	1
Chloride	3.9	3.4	3.5	3.2	3.5	3.0
Fluoride	0.0	0.2				
Nitrate	0.2	0.4				
Dissolved solids	32	38				
Total hardness	8	8	9	6	9	8
Specific conductance		31.1	39.4	38.5	39.5	34.2

Upper Little River near Lillington (continued)

	10-28-52	4-29-53	8-31-53
Discharge, c.f.s.	29.9	82.1	1.44
Bicarbonate	12	11	12
Sulfate	2	1	2
Chloride	4.0	3.8	3.2
Total hardness	9	8	8
Specific conductance	39.8	33.1	33.8
pH	6.3	6.1	6.2

Upper Little River at Swann, Lee County

	November 1, 1951		
Discharge, c.f.s.	2.51	Chloride	4.9
Silica	16	Fluoride	0.0
Iron	0.22	Nitrate	0.4
Calcium	3.2	Dissolved solids	50
Magnesium	1.6	Total hardness	15
Na + K	7.4	Specific conductance	61.0
Bicarbonate	26	pH	6.5
Sulfate	2.0	Color	35

West Fork Deep River near High Point, Guilford County

	March 20, 1947		
Mean discharge, c.f.s.	27	Bicarbonate	32
Color	14	Sulfate	4.8
pH	7.3	Chloride	3.4
Silica	17	Fluoride	0.5
Iron	0.02	Nitrate	0.2
Calcium	5.5	Dissolved solids	58
Magnesium	2.4	Total hardness	24
Na + K	6.4		

Cape Fear River Basin Pollution Survey Report - The State Stream Sanitation Committee, at its meeting on July 25, 1958 and in accordance with the provisions of Article 21 of Chapter 143, General Statutes of North Carolina, adopted the "Cape Fear River Basin Pollution Survey Report" prepared by the staff of the Committee and agreed to hold public hearings on proposed classifications of the waters in the basin at Greensboro, Fayetteville, and Wilmington on September 10, 11, and 12, 1958, respectively. The report contains information regarding sources of pollution in three drainage areas of the basin as follows:

Haw River Drainage Area

Glen Raven Mills, Altamahaw, discharges untreated domestic sewage and industrial waste directly into Haw River. During periods of low flow, these waters result in excessive B.O.D. and coliform bacteria and seriously reduce the dissolved oxygen in the river.

The Town of Kernersville discharges wastes from an Imhoff tank and sand filters into the headwaters of Reedy Fork. This plant appears to be heavily overloaded and should be either replaced, enlarged and more efficiently operated, or combined with another plant where the effluent will have more dilution.

Neither the North Buffalo Creek Plant or the South Buffalo Creek Plant of the City of Greensboro, due to overloaded condition as well as the effects of industrial wastes upon plant operations, is presently providing the degree of treatment necessary for the protection of the receiving streams. Construction of major improvements at the South Buffalo Creek plant is well under way, and plans are under preparation for treating all sewage and industrial waste naturally tributary to the North Buffalo Creek plant.

Burlington Mills, Ossipee, discharges untreated domestic sewage and a small quantity of slasher wastes into Reedy Fork near its mouth. These wastes add to the overall pollution problem in Reedy Fork and Haw River. Treatment thereof should be effected at the same time that treatment is provided at upstream sources of pollution.

Frissell Fabrics, Ossipee, discharges primary treated domestic sewage into Reedy Fork near its mouth. Provision of adequate facilities should keep pace with upstream improvements.

Copland Febrics, Inc., Copland Converting and Finishing Company, Inc., and Copland-Fowler Industries, Inc. (all under one ownership and management) discharge untreated sewage and untreated dye and finishing wastes into both Stoney Creek and Haw River. The sewage and wastes enter these streams at points so close together as to constitute a single source of pollution. Since this pollution enters Haw River in the recovery zone of upstream pollution, it retards this action and adds to the overall Haw River pollution problem. Steps should be taken toward providing needed sewage and waste treatment facilities as soon as possible.

The City of Burlington has two collection systems, one discharging sewage and industrial waste through the Haw River Outfall directly to the river at a point northeast of the City and other discharging sewage and smaller amounts of industrial wastes to a secondary type treatment plant on Little Alamance Creek south of the Town of Graham.

Haw River above the Burlington Haw River Outfall has recovered considerably from the adverse effects of upstream pollution from the Greensboro Area and other points of pollution. The untreated wastes from the City of Burlington materially retard this action and impose a large burden upon the river. Below the point of discharge of these new wastes, the river has an objectionable gray color and at times an offensive ofor. The dissolved oxygen is lowered to nearly zero on occasion, and the average is but 2.7 ppm. The untreated sewage results in very large numbers of coliform bacteria in the river.

The dissolved oxygen in Alamance Creek, about 2 miles below the point at which the plant effluent is discharged, averages but 3.0 ppm and has been reduced on occasion to nearly zero. The water at times has an objectionable odor, and fish kills have been reported in the vicinity of N. C. Highway 87 bridge. The Burlington pollution in Alamance Creek has an adverse effect upon the water in Haw River as this stream enters the degraded zone in and below the Burlington-Haw River-Graham-Swepsonville Area.

The City of Burlington has not been unmindful of its responsibility in these matters. Consulting engineers have been engaged, sewage and waste studies have been conducted, a treatment plant site has been approved and secured, and final plans are about completed for treating the sewage and industrial wastes presently being discharged directly to Haw River as the first step in an overall pollution abatement plan for the City. Necessary improvements at the present sewage-treatment plant have not been overlooked. While preliminary plans only have thus far been considered, the engineers have outlined a far-reaching plan for keeping abreast of the needs at this point. It is fitting that the first emphasis should be placed upon the Haw River problem; however, it is strongly urged that both projects be completed as expeditiously as possible.

Untreated sewage and industrial wastes of the Granite Plant of the Cone Mills Corporation at the Town of Haw River are discharged through several outfalls directly to Haw River immediately above U. S. Highway 70A bridge. The industrial wastes are from dyeing, bleaching, and desizing operations. Untreated sewage and industrial wastes are discharged from the Tabardrey Plant of Cone Mills Corporation through a single outfall directly to Haw River at a point on the east bank about 900 feet south of the Southern Railway bridge.

Haw River Sanitary District discharges untreated sewage and industrial waste directly to Haw River through an outfall located on the west bank 800 feet south of the Southern Railway bridge and a second outfall on the east bank 950 feet south of this bridge just below the Tabardrey Plant outfall.

The Haw River Sanitary District and Cone Mills Corporation have not been unmindful of their respective responsibilities. The District engaged consulting engineers who, with the cooperation of Cone Mills Corporation, conducted sewage and waste studies as a basis for a preliminary report which recommended a single treatment plant for all of the sewage and waste. It is urged that every effort be made to construct such a plant at the earliest possible date.

The primary treatment plant of the Town of Mebane is overloaded. The effluent therefrom creates foul conditions in Moadams Creek, the receiving stream which, on occasion, is without flow except for the waste therein. The stream water below the treatment plant is devoid of dissolved oxygen, and the stream banks are covered with sludge. In order to alleviate the foul and offensive conditions, secondary treatment should be added as rapidly as possible.

Untreated wastes of the Town of Graham are discharged into the degraded

zone of Haw River below upstream pollution and into the backwaters of the impoundment of Haw River caused by the dam at Swepsonville at a point a short distance below N. C. Highway 54 bridge and opposite the mouth of Back Creek. The river below the outfall contains sludge deposits and septic odor, while the industrial waste in the discharge colors the waters with various hues. In 1954, the hydroelectric-power station below the dam was used intermittently due to the dry season. This caused a slow movement of water through the two-mile-long impoundment. While some improvement was noted in river conditions just above the waste discharges from Virginia Mills, Inc., below the dam at Swepsonville, the dissolved oxygen in the river water was reduced to nearly zero on occasion. In order that the Town of Graham may reduce its share of the overall pollution, a plant providing complete treatment should be constructed as rapidly as possible.

Virginia Mills, Inc., Swepsonville, discharges untreated sewage and industrial waste into the backwaters of a second impoundment or power pool on Haw River controlled by this Company. Due to the intermittent operation of the upper and lower hydroelectric-power stations under 1954 conditions, the wastes tended to move slowly through the lower impoundment, thus causing an accumulation of slow-moving waste. These wastes, while relatively small as compared to upstream pollution, nevertheless added to the already complex problem. In fact, the additional load, on occasion, reduced the dissolved oxygen to zero in the water a short distance below the upper dam and increased the B.O.D. from an average of 8.9 ppm to 11 ppm. The overall pollution in Haw River, including that discharged with the water of Alamance Creek, showed that the degraded zone of Haw River continued to the lower dam. Virginia Mills, Inc., should install remedial pollution-abatement measures in keeping with upstream progress.

Chester H. Ross Men's Hosiery and Knitting Mill, Alamance, discharges untreated sewage directly to Alamance Creek. The main effect of this sewage discharge is to increase the coliform bacteria in Alamance Creek. The equivalent of secondary treatment should be provided for this sewage in keeping with upstream progress and practice.

Seller's Manufacturing Company, a county school, a Baptist Church and parsonage, an apartment with four units, three houses, and a Methodist Church are sources of pollution discharged either directly to Haw River or via the short tailrace from the hydroelectric-power station located at the dam a short distance from the Company's mill. The Company discharges this pollution, untreated textile-waste and sewage, through three outfalls from the mill and two from the Village of Saxapahaw located across the river from the mill below the Company's dam and a highway bridge. The school, Baptist Church and parsonage, and the apartment are connected to one of these village outfalls, and the houses and the Methodist Church are connected to the other outfall.

The organic pollution from all sources in the Saxapahaw Area has a P.E. of 2,665, 153 of which is due to sewage mercerizing results in a caustic waste being discharged to the river, giving it a soapy appearance and a chemical odor. The pH of the river water in 1954 was increased by the caustic waste from a low of 7.2 above the mill to a high of 9.4 below the mill. Under the dry-weather conditions prevailing at that time, no water for dilution of the sewage from the village spilled over the dam except on occasion of heavy railfall. Consequently, sludge deposits accumulated between heavy rains, and offensive odors prevailed.

It is understood that Seller's Manufacturing Company has been giving consideration to treating not only its waste, but all of the wastes in the Saxapahaw Area, in a common treatment-plant. It is urged that such a plant be

constructed at the earliest date practicable in order that necessary river-improvements, including protection for the public water-supply at Bynum, may be effected.

Domestic water for O'Dell Manufacturing Company and the Town of Bynum, and for the hydroelectric power-station operated by the Company, flows through a canal to the station where about 8,000 g.p.d. are taken, above the trash rack and the local pollution, for domestic consumption. After treatment, the domestic water is supplied to the mill employees and residents of the Town. Sewage from the mill is discharged without treatment into the tailrace and thence to the river. While this sewage is primarily a local nuisance, it increases the concentration of coliform bacteria in the river below the mill. For both reasons, it should be either removed from the river and disposed of by subsurface methods, or receive proper treatment prior to its discharge to the river.

The Town of Pittsboro has a very poorly-operated primary sewage-treatment plant which is heavily overloaded with municipal sewage and industrial waste from the Pittsboro Poultry Company. During dry seasons, most of all of the upstream flow is diverted for the municipal water-supply; consequently, very little flow is available below the water-supply dam for diluting the effluent from the sewage-treatment plant. In 1954, the stream, below the point of effluent discharge, was gray in color and contained floating solids and coliform bacteria. The dissolved oxygen was as low as 0.5 ppm. The banks of the stream were covered with sludge and algae deposits. The absence of sludge-drying beds and the location of the plant make maintenance very difficult. Secondary treatment is necessary to protect downstream uses; better yet, a new, complete sewage-treatment plant should be constructed at a location where proper maintenance and better dilution may be obtained, if practicable.

Webster Poultry Company, Pittsboro, discharges untreated waste from poultry-dressing operations into Turkey Creek below a pasture. In 1954, the only flow in this creek was the untreated waste, and foul conditions, pertaining to B.O.D., coliform bacteria, and dissolved oxygen, resulted. The water had a septic odor and a greenish-gray color. Complete treatment, by conventional means or its equivalent, is necessary to protect downstream uses. Relative to such uses, Robeson Creek, in the vicinity of the Gould Farms irrigation-intake below both Webster Poultry Company and Town Pittsboro pollution, was not, at all times in 1954, of a quality acceptable for irrigation purposes. The dissolved-oxygen content was, on occasion, near zero.

Virginia Carolina Chemical Corporation, Durham, discharges waste to a ditch which enters the headwaters of Third Fork Creek, a major tributary of New Hope River, above one of the three sewage-treatment plants of the City of Durham. During dry periods, the flow in the headwaters is largely these wastes which become a mere trickle at the boundary of the City of Durham. In March 1956, the combined wastes had a pH as low as 0.9, phosphates as high as 150 ppm, sulfates as high as 270 ppm, and fluorides as high as 9,600 ppm below the plant, and a pH as low as 1.3, phosphates as high as 5.5 ppm, sulfates as high as 140 ppm, and fluorides as high as 16 ppm at a point about 1.5 miles below the plant. These conditions are such as to interfere seriously with beneficial downstream-uses of Third Fork Creek. The wastes should either be treated separately or discharged to the City of Durham sewerage with appropriate safeguards.

The City of Durham has three sewage treatment plants, Northside Plant in the Neuse River Basin and New Hope and Third Fork Creek Plants in the Haw River Drainage Area. In 1954, the dissolved oxygen, in New Hope Creek below the outfall sewer of New Hope Plant, was low with a minimum of 1.0 while

coliform bacteria were present in considerable numbers and, at a point about 3.0 miles below the outfall sewer, an ill-defined channel caused the water to pool and tend to spread over flood plains. Additions and improvements are underway at the Third Fork Creek Plant to protect beneficial downstream-uses. It is urged that the remaining steps, to improve the operations of the two plants in the Haw River Drainage Area, be taken as rapidly as possible.

Swartz Tallow Company, near Durham, operates a rendering plant, on the headwaters of Gum Creek, almost exclusively on refuse from poultry-processing plants. The wastes consists of condenser water and general-washdown water. The condenser water is recirculated through a pond which overflows only during wet weather. The washdown water flows through a grease trap and a settling tank which provides little treatment. Grease is recovered daily from these devices and solids on a weekly basis. The settling tank is on a fill and draw basis, the supernatant, so called, being pumped to Gum Branch once or twice daily. The stream, for a short distance below the point of waste discharge, contains visible evidence of pollution and has a slight odor. These wastes should be treated in keeping with requirements to preserve water quality which will be assigned when this stream is classified.

The Town of Carrboro, in 1954, treated domestic sewage in a poorly operated, heavily overloaded primary-treatment plant located on Morgan Creek below University Lake. The Town has secured approval of plans for plant improvements. The plans provided step installations which have progressed to the extent as to afford considerable protection to the stream. It is urged that the remaining steps be taken as rapidly as possible.

The Town of Chapel Hill has a sewerage system which serves the Town, the University of North Carolina, and four laundries. The system comprises two complete sewage and industrial waste treatment plants, one on Morgan Creek below the Carrboro sewage-treatment plant and one on Bolin Creek. The effluent from the Morgan Creek Plant should be chlorinated. The Bolin Creek Plant has reached its designed capacity from the viewpoint of organic loading, and an engineering study should be made with the view of modernizing this plant to meet the existing load and to anticipate the growth of this part of the Town.

The Town of Apex has two primary sewage-treatment plants, one of which discharges to Middle Creek in the Neuse River Basin while the other, an Imhoff tank,discharges to Beaver Creek, a tributary of New Hope River. The Beaver Creek plant is poorly-operated and overloaded. The dissolved oxygen in the creek, below the point of effluent discharge, is zero at times, and coliform bacteria are found in very large numbers. These objectionable conditions are intensified by the fact that the receiving stream has very little flow and, at times, goes dry. Secondary treatment is required to protect this stream, if the Town continues to discharge sewage at this point. The conditions at the Middle Creek plant are similar to those at the Beaver Creek plant. The Town should have an engineering study made to determine the best course of action.

Deep River Drainage Area

Oakdale Cotton Mills, Inc., Jamestown, discharges an estimated 25,000 g.p.d. of untreated domestic sewage and dye waste through two outfalls into a canal immediately below the water-supply dam of this corporation at the north bank, and thence into Deep River just above the adjacent highway bridge. Jamestown Cotton Mills, Inc., Jamestown, discharges an estimated 20,000 g.p.d. of untreated dye waste directly to Deep River below the bridge and diagonally across the river from the wastes of Oakdale Cotton Mills, Inc.

The discharges of wastes from these two mills are so close together as to preclude the separation of their effects upon Deep River. These wastes create a nuisance which is aggravated by the fact that the water in Bull Run, which drains part of Jamestown, is not of the best quality with particular reference to the large numbers of coliform bacteria found in this stream. Indications are that all of the local sewage-disposal systems are not functioning properly. An engineering study of the mill waste and sewage should be made to determine the best means of treatment. Such a study should include an evaluation of the needs of Jamestown for a sewerage system and sewage treatment which might well be combined with the needs of the mills.

Jamestown High School discharged without treatment, in 1954, kitchen wastes from a lunchroom into a ditch 0.2 mile above its junction with Deep River. The domestic wastes from the school are treated in five small treatment-plants consisting of septic tanks followed by nitrification trenches. The nitrification field, serving the largest septic-tank, appeared to be overloaded in 1954 to the extent that effluent was seeping into a small ditch that flows through the Highland Container Company property. Any drainage from the other septic-tanks flows through another ditch and enters Deep River above the Jamestown water-supply intake.

Highland Container Company discharges domestic sewage, treated in a plant consisting of a septic tank and sand filters which appeared, in 1954, to be functioning satisfactorily, into a ditch which also has seepage from the Jamestown High School treatment-plants. The ditch joins Deep River approximately one mile above the Jamestown water-supply intake. The Company's mill also has an industrial waste that consists of two 10,000-gallon tanks of starch which are emptied directly into the stream once or twice weekly. Enzymes are added to the starch in the holding tanks before discharge. This merely converts the starch into sugars, thus providing no B.O.D. reduction. The waste is discharged to the ditch receiving the effluent from the domestic-sewage treatment facility.

The sewage and industrial wastes, discharged from the sewerage system serving the City of High Point, constitute the major source of pollution in the Deep River Drainage Area. Richland Creek is highly polluted for approximately one mile above its junction with Deep River. The creek is also highly colored with dye wastes, contains extensive sludge-deposits, and has an offensive odor. The present sewage-treatment plant is seriously overloaded and should be extensively enlarged and improved. The City has employed a consulting engineering firm which is presently engaged in studying and planning necessary plant-improvements.

Commonwealth Hosiery Company at Randleman discharges, into Deep River, sewage and industrial waste which are significant in that they add color to the stream and increase the coliform bacteria.

Cone Mills Corporation, at Randleman, discharges a nominal amount of raw domestic-sewage into Deep River. The mill uses cold-water tints on goods for identification purposes from which there is little or no waste. This waste has very little influence on the oxygen assets of the stream, but does add greatly to the coliform bacteria present.

The effluent from the sewage plant of the Town of Randleman considerably increases the B.O.D. and coliform bacteria in Deep River. A large number of coliform bacteria are still found in the river approximately two miles downstream. Secondary units should be provided and put into operation at this plant to give the river adequate protection. The plans for these improvements, if practicable, should include the collection and treatment of the sewage and/or waste from the

Commonwealth Hosiery Company and the Cone Mills Corporation.

Leward Cotton Mills, Inc., Worthville, discharges to Deep River domestic sewage and industrial waste comprising residue from cleaning the slasher machine. Because of a slight rapid in the river just below the outfall, the waste causes a heavy, white, foamy film on the surface of the stream. The slasher waste should be segregated from the domestic sewage and disposed of in an absorption field, while the domestic sewage should be treated by means of a septic tank and sand-filter unit.

The City of Asheboro discharges wastes to Penwood Branch after primary treatment in an Imhoff tank, and discharges wastes to Haskett Creek without treatment. Penwood Branch, below the effluent from the sewage-treatment plant, has an average D.O. content of less than one ppm, an average B.O.D. of 260 ppm, and a high coliform-bacterial content. It has very little natural-flow, a heavy-gray color, and a strong sewage-like odor. The banks are covered with heavy sludge-deposits and algae-growth. At the mouth of this branch approximately three miles downstream, the conditions indicated have improved very little. Below the point at which untreated sewage and industrial waste are discharged to Haskett Creek, the conditions are similar to those in Penwood Branch. These streams have been the subject of many complaints from local people. The City has employed an engineer and is developing plans for new treatment-facilities. Consideration should be given to including certain unsewered fringe-areas in these plans.

North Asheboro-Central Falls Sanitary District partially treats domestic sewage in an inadequate Imhoff tank that is poorly maintained. It has employed an engineer and is planning for a large expansion of its sewerage system which is to include appropriate treatment of sewage and waste. The expanded system should include, in the overall plan, the present small system and all industrial waste in its area not already discharging to a public-sewerage system.

Jordan Spinning Company, at Cedar Falls, discharges untreated domestic-sewage to Deep River, adding to the pollution load already present in the river which has not recovered fully, at this point, from the effects of upstream pollution. This addition could be completely removed by installing a septic tank with nitrification lines or a sandfilter to handle the small volume of sewage involved.

Randolph Mills, Franklinville, discharges untreated sewage and industrial wastes either directly to Deep River or indirectly by a canal passing under the mills to the river. This condition undoubtedly contributed to a fish kill in 1957. The sand filters of a small sewage-treatment plant are grown over with weeds, and the septic tank of the plant appears to be receiving little or no maintenance. It is essential that the sewage and wastes be treated to a degree sufficient to protect downstream uses.

The Town of Liberty has three sewage-treatment plants, one on Sandy Creek above the Ramseur water supply and two in the Rocky River drainage area above the Siler City water supply. The filters of the Sandy Creek plant were either clogged or unevenly graded, and much of the sludge was merely thrown on the ground at the side of the bed. The clogged bar-rack of the Southwest Plant caused raw sewage to overflow into the stream, and the grounds were very unsightly at the time of several examinations. The Northeast Plant was an overloaded septic tank which received little maintenance, causing a foul condition in the receiving stream. This septic tank has been replaced by a secondary treatment-plant that appears to be doing a good job. The other two plants, in

addition to being very poorly operated, have reached, or are about to reach, their designed capacity. An engineering study should be made with the view in mind of either replacing the two small plants or making satisfactory additions. In the meantime, they should be placed in the best of operating condition and be carefully operated in order to protect the respective water-supplies.

The Town of Ramseur discharges domestic sewage to two Imhoff tanks. Both plants have either reached or are approaching their designed capacity. It is obvious that the best of primary treatment is insufficient to protect beneficial downstream-uses under critical conditions of low flows and summer temperatures. The Town Officials have initiated studies regarding measures required to protect such uses. It is urged that the necessary measures be carried out as rapidly as possible.

Enterprise Manufacturing Company, at Coleridge, discharges untreated domestic-sewage into the canal just above the hydroelectric-power station. This sewage creates a local nuisance and could be completely removed by installing a septic tank with nitrification lines.

The cannery of Lucks, Inc., at Seagrove, collects waste in a holding tank, the solids from which are pumped out periodically. When the tank overflows, it drains into a highway ditch which flows to the headwaters of Bear Creek. The stream bed, at this location, is filled with garbage and debris. It becomes a local nuisance which results in complaints. The success of this waste-disposal system lies in collection of all the waste and its removal from the premises. If this collection and removal cannot be accomplished, appropriate treatment-facilities must be installed.

The Town of Star has three sewage-treatment plants, one in the Yadkin River Basin and two septic tanks which discharge to the headwaters of Cotton Creek. This stream, approximately one mile downstream from the lower tank, contained no dissolved oxygen and had a high coliform-bacteria content. The Town has employed an engineer and is discussing plans to improve conditions. It is urged that remedial measures be installed at the earliest practicable date.

The Town of Biscoe has two treatment plants, one discharging to the Yadkin River Basin and an Imhoff tank, with sand filters, discharging to Lick Creek which, at approximately one mile below the plant effluent, has an objectionable odor, gray color, and heavy sludge-banks, contains no dissolved oxygen, and has an excessive number of coliform bacteria. These objectionable conditions cause the stream to be a local nuisance. The present facility would probably be adequate if it is put into first-class condition and then maintained and operated properly.

The Town of Candor discharges domestic sewage into the headwaters of Cabin Creek from a greatly-overloaded Imhoff tank that needs maintenance. Even under winter-weather conditions, dissolved oxygen is reduced, the B.O.D. is greatly increased, and coliform bacteria in large numbers are found, in Cabin Creek. The stream has a gray color and a strong sewage-like odor. The banks are covered by a heavy growth of dark-green algae and sludge deposits. This plant should be replaced by units large enough to take care of the Town's present needs and future growth.

The Town of Robbins, during the period of study, discharged sewage and industrial waste to a primary treatment-plant on Bear Creek. The dissolved

oxygen therein was as little as 1.0 ppm, the maximum B.O.D. was 11 ppm, and the coliform-bacteria content was high. The stream along the right bank was gray in color, while the bottom and the vegetation were covered with layers of sludge. Waste from cold water tint dyeing has a rather high B.O.D. and contains a large amount of salt. Operations of two poultry-processing plants, because of clogging of the bar rack and settling-tank weir with feathers and coagulated blood, interfere seriously with operation of the treatment plant. The Town has employed an engineer who is making a comprehensive study of present conditions with a view to improving the receiving stream. It is urged that studies be completed and remedial measures be constructed as rapidly as possible.

Currie Mills, Inc., at Highfalls, discharge domestic sewage into Deep River via the raceway. This sewage causes an undesirable color and an unsightly condition on the surface of the water immediately below the outfall. This local nuisance could be completely removed by installing a septic tank with nitrification lines.

The sewerage system of the Town of Carthage has three outfalls. An Imhoff tank, on one of the outfalls, discharges into a ditch that has been fouled by sludge deposits and heavy green algae. The sand filter of this plant has been long abandoned. The north outfall discharges raw sewage into Little Creek which has been the source of complaints because of its use for cattle watering and because of odors. The west outfall discharges into an almost-dry ditch and causes extreme odors in warm weather and complaints from downstream landowners. The stream is covered with sludge deposits and green algae. Foul conditions, in 1954, existed at and immediately below the three outfalls. Treatment other than simple lagooning is required to protect downstream uses.

The City of Sanford has two sewage-treatment plants, one of which discharges into the Upper Little River and the other (Spring Lane Plant) discharges sewage and most of the industrial waste into Big Buffalo Creek. Spring Lane Plant has a heavy B.O.D. load and an operating efficiency of 70 percent. Dissolved oxygen in the stream below the plant is reduced to zero, the average B.O.D. is increased to 59 ppm, and the coliform-bacteria content is high. Additions and improvements should be made to bring the plant's operating-efficiency up to present requirements and for a reasonable period in the future. Arrangements should be made to cover the northeast section of the Town, part of which is unsewered and from which Little Buffalo Creek carries storm drainage.

The primary sewage and industrial waste treatment plant of the Town of Siler City, which discharges effluent into Loves Creek, is heavily overloaded and is removing very little B.O.D. Immediately below the plant, the stream has no dissolved oxygen, an average B.O.D. of 320 ppm, and a very high coliform-bacteria content. The water has a strong sewage-like odor, varied colors, and floating solids approximately two miles below the outfall. Plans should be made to enlarge and properly operate and maintain this plant as rapidly as possible.

Cape Fear River Drainage Area - Junction of Haw and Deep Rivers to the Atlantic Ocean

Partially-treated sewage, from about 115 employees at Carolina Power & Light Company's steam plant on Cape Fear River at Moncure and 25 residents who live in nearby houses, is discharged partially to a septic tank with nitrification lines and partially to a septic tank with an effluent line to the large impoundment formed by Buckhorn Dam. The sewage discharged to the latter tank

should either receive additional treatment or be disposed of by subsurface means.

The Town of Fuquay Springs operates a primary sewage-treatment plant that is obviously overloaded. The effluent is discharged into Kenneth Creek which is devoid of oxygen at times and contains a very high caliform-bacteria content. The stream water has a slight sewage-odor and a gray color, while the stream bed contains sludge deposits. The sludge from the drying beds is not hauled off regularly but is merely placed in large piles next to the beds. The stream above the outfall has been visibly polluted by garbage and drainage from a sanitary land-fill, and possibly by drainage from private outfalls. Plans for additions and enlargements for this plant, or possibly for complete replacement of the entire plant taking into consideration inclusion of those parts of the Town that are not yet sewered, should be made. An engineer has been employed, and a preliminary report has been prepared.

The Town of Lillington discharges untreated sewage into Cape Fear River. The water immediately below the outfall is discolored, while the river bed at the outfall is covered with sludge deposits which are flushed downstream during periods of high flow. Until this sewage receives appropriate treatment, it poses a constant public-health hazard to the water supply of the Town of Dunn, the Town of Erwin, and Erwin Mills.

Campbell College, at the Town of Buies Creek, operates a sewage-treatment plant consisting of a septic tank, Buies Creek, at its confluence with Cape Fear River, contains considerable numbers of coliform bacteria. A public-health hazard, which can only be corrected by installation of additional treatment-facilities at this plant, is involved.

Moores Dairy, Erwin, discharges waste into Stuart Creek above the untreated sewage and industrial waste from the Town of Erwin and Erwin Mills. The milk-plant waste discolors the creek, increases B.O.D. and the numbers of coliform bacteria, and decreases the dissolved oxygen. Corrective measures are indicated.

Untreated sewage and industrial waste from the Town of Erwin and Erwin Mills are discharged to Stuart Creek which is highly discolored and the bed of which contains a black sediment and sludge deposits. The dissolved oxygen in the creek is reduced to zero on occasion, the B.O.D. averages 120 ppm, and the coliform-bacteria content is very high. Cape Fear River below Stuart Creek is discolored by dyes discharged from Erwin Mills and has a considerable coliform-bacteria content. This untreated sewage and waste must receive adequate sewage treatment. Complete treatment is indicated.

Part of the sewage of Pinehurst, Inc., is diverted to a sewage-treatment plant on a stream tributary to Lumber River while the remainder is discharged to a stabilization pond on Broad Creek which had an average B.O.D. of 6.8 ppm and a high coliform-bacteria content. The Corporation has constructed a waste-stabilization pond and is experimenting with its use. More time and study are needed to determine the efficiency of a treatment facility of this kind in this area.

The Town of Southern Pines operates a trickling-filter plant that discharges into McDeeds Creek. The effluent from this plant reduces the dissolved oxygen in the stream to as little as 2.5 ppm at times and increases the numbers of coliform bacteria to such values as to be a public-health hazard to bathing in Crystal Lake. The Town has initiated a program to study the possibility of making needed enlargements and improvements of the present sewage-treatment

plant. Consideration should be given to constant and adequate chlorination of the effluent during the summer months to protect the bathing downstream in Crystal Lake.

Cumberland Sand and Gravel Company near Fort Bragg discharges fines and organic matter to an embankment from which these wastes flow to Buffalo Creek. A heavy turbidity is caused in the creek and for a considerable distance downstream in Lower Little River. Complaints have been made as to the presence of turbidity at the Fort Bragg water-intake.

The sewerage system, serving Fort Bragg and Pope Air Force Base, is well designed and excellently maintained. Larger numbers of coliform bacteria than are desirable are found, on occasion, in the creek water below the effluent outfall. This unsatisfactory condition can be readily corrected by means of effective chlorination.

Spring Lake Enterprises, Inc., operates a sewage-treatment plant the effluent from which is discharged to a small stream which enters Lower Little River below McDuffie Creek. The dissolved oxygen in the small stream is reduced to as little as 1.5 ppm, the B.O.D. is as high as 58 ppm, and the coliform-bacteria content is excessive. The plant is poorly maintained and corrective measures are imperative.

Sycamore Dairy, Fayetteville, discharges untreated milk-plant waste into Hybarts Branch. This waste not only creates a nuisance in the stream immediately below the plant, but also causes large growths of algae downstream. Either very complete treatment should be given this waste or it should be discharged into the Fayetteville sewerage system.

The City of Fayetteville discharges untreated sewage and/or industrial waste into Cross Creek and Atkinsons Canal. Both streams show evidence of gross pollution. Both Cross Creek and Blounts Creek above the sewer outfalls are receiving large amounts of pollution from industries and possibly from unknown private sewers. The dissolved oxygen in Cape Fear River below the pollution is reduced to as little as 1.8 ppm and coliform bacteria are found in large numbers. A new sewage-treatment plant is well under way. The City should take immediate steps to enact ordinances prohibiting discharge of untreated sewage to its streams with adequate provisions for preventing injury to the new plant.

Holt-Williamson Manufacturing Company, at Fayetteville, discharges waste into Atkinsons Canal. This waste adds to the gross pollution in this stream and should either receive the same degree of treatment as to be given the Fayetteville sewage and industrial waste, or be discharged to the Fayetteville sewerage system for treatment in the new plant.

McDaniel Abattoir, East Fayetteville, has a settling basin and a blood trap. This system is not being properly operated and possibly it is too small. Dried blood and algae growths were observed along the banks of the receiving stream, Buzzard Branch.

The present treatment-facilities should either be put into good-working condition or be completely replaced with new and adequate treatment-devices, if this action is found to be necessary.

Esso River Terminal, near Fayetteville, has some spills in the process of transferring liquid asphalt from river barges to storage tanks on shore.

Debris and growth along the dock and downstream is covered with asphalt and, at times, the surface of the river has been so covered. This waste is a threat to fish life and may be a source of phenols in downstream water-supplies. It is imperative that this problem be controlled.

Underwood Poultry Company, near Fayetteville, discharges waste into a road ditch that flows to Cape Fear River. The stream contains a heavy scum. Its banks, for a considerable distance downstream, are covered with dried blood and sludge. This waste is a local nuisance and adds to the pollution in the river. The waste should either receive adequate local-treatment or be discharged to the Fayetteville sewerage system.

The Town of Raeford has a treatment plant that serves approximately 3,000 people, a large poultry plant, and textile mills of the Amerotron Corporation. Rockfish Creek, below the plant's outfall, contains sludge deposits, foam, and floating grease. Large numbers of coliform bacteria were found in Rockfish Creek as far downstream as the bathing areas in Lake Tom Upchurch. These bacteria greatly exceed limits normally considered safe for outdoor bathing-waters. This public-health hazard can be improved by providing complete treatment for this partially-treated sewage and waste and by chlorination of the effluent. It cannot be completely eliminated by these means.

Brower Mills, at the Town of Hope Mills, discharges untreated domestic-sewage into Rockfish Creek. Coliform bacteria, in the creek below this discharge, are excessive. Installation of a septic tank with nitrification lines would completely remove this waste from the stream.

The sewer plant of the unincorporated community of Bonnie Doone discharges effluent to Jacks Ford Branch which has a heavy-gray color and a strong sewage-odor. The banks of the stream are covered with sludge. Even with major improvements including chlorination of effluent, the public-health hazard to bathing in Hope Mills Pond # 1 cannot be completely eliminated.

The unincorporated Town of Cumberland has a small sewage-treatment plant, the effluent of which, in Little Rockfish Creek, has a slight septic odor and a light-gray color. The public-health hazard, from this effluent, to bathing in Hope Mills Pond # 1 can be improved, but cannot be completely eliminated, by major changes.

Effluent from the sewage-treatment plant of the Town of Hope Mills is discharged into Little Rockfish Creek. It has a slight septic odor, and floating solids can be seen on the surface of the creek. This plant needs maintenance, good housekeeping, and constant proper operation.

Thompson Plywood Corporation and Southern Resin and Glue Company, at Vander, discharge untreated wastes to ditches which are very swampy and, in part, are covered with bark. The water has a strong odor of formaldehyde at times and contains as much as 0.7 ppm of this substance. A nuisance results and is accompanied by numerous complaints. Obviously, corrective measures are necessary.

The Town of Elizabethtown has a sewage system that discharges untreated domestic-sewage into Cape Fear River. The chief effect of this sewage is to increase the number of coliform bacteria in the river water which are a public-health hazard in relation to the Wilmington water-supply which is taken from the river at a short distance from Lock # 1. Corrective measures are, therefore, indicated for protection of this water supply.

Bladen Slaughterhouse, near Elizabethtown, is located on a swampy stream tributary to Browns Creek. There is some depression of the dissolved oxygen and an increase in B.O.D. in Browns Creek below this waste.

Butler Market Abattoir discharges blood and washdown water to Browns Creek about 1.5 miles below the Bladen Slaughterhouse. The general effect of this waste is to retard the return of the stream to the condition found above the two wastes. There is a pronounced objectionable-odor in the stream immediately below this plant, and the water has a brownish color.

Riegel Paper Corporation, Acme, discharges sewage to a large holding-basin or lagoon, together with all of its industrial waste, prior to entrance of the sewage and waste into Cape Fear River. It was found that reduction of pollution through the lagoon was 13 percent. In the summer of 1956, the average dissolved oxygen, at sag points 6 and 12 miles below the outfall, was 2.2 ppm and 1.5 ppm, respectively. Thousands of dead fish were observed in the river for some distance below the outfall on one occasion in 1955. The present lagoon is inadequate for protecting the river under all conditions. It is very obvious that Riegel Paper Corporation will have to take additional action, while the City of Wilmington and the industries in that area will also have to take corrective action, in some instances, if this important fishery is to be preserved.

The sewage-collection system of the Town of Clinton discharges untreated sewage and industrial waste into Mill Creek at its confluence with Dollar Branch. A large quantity of industrial waste is received from Lundy Packing Company. The stream, below the outfall, is in extremely-foul shape. The study indicated that private outfalls or storm sewers are being used to discharge sewage or industrial waste directly to the stream. The City should immediately bring the plans, prepared several years ago, up-to-date and construct adequate treatment-works in order to remove this heavy pollution load from the stream.

The sewage system of the Town of Salemburg, serving Pineland College and Edwards Military Institute, discharges untreated sewage into Little Coharie Creek above the mouth of Rye Swamp. The net effect of the sewage is to increase the number of coliform bacteria in the stream water, and corrective measures are indicated to protect downstream users. In developing plans for treatment facilities for Salemburg, the engineer should consider the large fluctuation of people served during the school term and during the summer.

The Town of Roseboro has two sewage-treatment plants, both of which are septic tanks without secondary treatment. One plant discharges into Little Coharie Creek, and the other plant discharges into Mill Creek, tributary to South River. The stream bed of Mill Creek has sludge deposits, while the water has a distinctive sewage-odor and a gray color. Obviously, corrective measures are necessary. Coliform bacteria are found in large numbers in Little Coharie Creek and indicate corrective action. The Town should give consideration to treatment of the sewage in one central plant, located where there is a receiving stream with ample dilution-water.

The Town of Warsaw has an Imhoff tank discharging into Stewarts Creek. At a point on the creek 2.3 miles below the plant, there is a deficiency of dissolved oxygen, and large numbers of coliform bacteria are found. The creek is very swampy and slow-moving and, where the plant effluent enters it, a local nuisance is created. Corrective action is indicated.

The Imhoff tank of the Town of Magnolia drains into the headwaters of Millers Creek. The stream is very small at the plant and, at times, the effluent

is the only flow in dry weather. This condition causes sludge beds in a rank growth of weeds. The creek is very swampy and sluggish, causing the sewage to stand and become steptic. This condition creates a local nuisance along the stream. Corrective action is necessary.

The Imhoff tank of the Town of Angier discharges into a very-swampy section of the headwaters of Black River the flow of which is very low in dry seasons. The stream, below the outfall, has a brownish color with some visible sludge banks and green algae. A control station, above the outfall, indicates that the stream is receiving pollution from other parts of the Town. The present treatment-plant is in poor operating-condition and was outgrown long ago. The plant should be completely renovated or replaced.

The City of Dunn has two sewage-treatment plants. One plant discharges into "Little Black River". The area around the outfall has a very heavy undergrowth with a very distinctive sewage-odor and a heavy layer of black, sludge-like muck. The plant appears to be overloaded and should be relieved of some of its pollution load. The other plant discharges into a very swampy area at the mouth of a small tributary to Mingo Swamp, called Stoney Run. The effluent has a heavy turbidity, and the banks, below the outfall, contain a heavy growth of algae and sludge deposits. This plant was built with the intention of later adding secondary treatment. The land is available at the present plant-site, and it is now time for additional improvements. If practicable, all of the sewage should be discharged to one plant for treatment.

Wellons Candy Company, near Dunn, discharges industrial waste into the headwaters of Stoney Run and into the backwaters of Hannas Pond which is a fishing lake. This waste, which contains large quantities of sugar, has a B.O.D. of 6,600 ppm and a high pH of 9.0. On occasion, the dissolved oxygen is reduced to as little as 1.5 ppm at a point below the dam at Hannas Pond. This waste is a potential hazard to fish life.

Armour Fertilizer Company and Virginia-Carolina Chemical Company, Navassa, discharge sewage, cooling water, and scrubber-tower water into Cape Fear River without treatment. The discharge, at both plants, is a nuisance which may be readily abated by discharging the sewage to subsurface disposal-works.

Mount Olive Pickle Company discharges industrial waste into Barlow Branch. The waste has a high chloride-content and is highly organic and acid. The stream was very turbid, had a sickening odor and a dark-green color, and was very heavy with floating solids. This Company should follow the leadership of the Town of Mount Olive, which is constructing a sewage-treatment plant expected to be in operation in the near future, and should take prompt action to abate the Company's share of the very critical situation in Northeast Cape Fear River downstream from the Town.

The Town of Faison has a treatment plant that has been abandoned for several years. The stream into which the plant discharged, Reedy Branch - a tributary of Goshen Swamp, is very slow-moving and has a small flow. A sewage gray color can be observed in the water in the vicinity of the outfall. The plant should be replaced, and the Town should remove the pickle company's waste from the system or require that this waste be pretreated before being accepted into the system.

The treatment plant of the Town of Rose Hill discharges effluent in a small canal that drains to Island Creek. Approximately 300 feet downstream

from the outfall, the dissolved oxygen in the stream is reduced to zero, the average B.O.D. is 42 ppm, and the coliform-bacteria content is excessive. Obviously, corrective action is necessary.

Bonds Abattoir, at Wallace, discharges blood and washdown water into a dry ditch approximately one-half mile from Rock Fish Creek. The stream bed is loaded with black-sludge deposits and dried blood, causing a very-putrid odor. Corrective action is required to prevent a local nuisance and to protect the creek.

The southwest plant of the Town of Wallace discharges into Rock Fish Creek. During periods of heavy rainfall, the outfall line tends to clog up and causes the sewage to overflow into the swamps and Northeast Cape Fear River. The northeast plant discharges into Little Rock Fish Creek. It is located in a swampy area in which there can be little fall in the effluent line. Corrective action is necessary at both plants. Consideration should be given toward treating all of the sewage in a centrally-located plant and treating industrial wastes from J. P. Stevens Company and an ice cream plant in a common plant.

Wallace Pickle Company discharges untreated industrial-waste into a ditch that flows through the residential section of the Town of Wallace to Little Rock Fish Creek. The waste is highly organic and usually acid. The disposal of this waste constitutes a nuisance and should be corrected.

The sewage-treatment plant of the Town of Burgaw discharges into a small ditch, called Osgood Canal, that drains into Burgaw Creek. The water in the ditch has a gray color and a sewage odor. Heavy-green algae grows along its banks. The movement of the effluent in Burgaw Creek is very slow, and the banks of the stream and the stream bed have become fouled with sludge and a thick growth of algae. The plant and its grounds appear to be in poor condition. Obviously, corrective measures are necessary to protect the receiving stream.

Waste from Wilmington Packing Company, near Castle Hayne, is discharged into a very swampy and slow-moving section of Prince George Creek. The stream below the outfall has a blood-red color and, at times, has a scum of coagulated or dried blood. The muck along the bank is black and oily and has a rotten-meat odor. Corrective action is indicated.

Swift & Company, Wilmington, discharges sewage, cooling water from the sulphuric-acid plant, and scrubber-tower water into Northeast Cape Fear River without treatment. The combined industrial wastes are acid in character, contain fluorides, and do not appear to change materially the pH of the river water. The sewage should be treated by subsurface disposal-methods.

The City of Wilmington discharges untreated sewage and waste, through 16 outfalls, to Smiths Creek, Northeast Cape Fear River, and Cape Fear River. The high concentration of sewage, between the mouth of Northeast Cape Fear River and the docks of the North Carolina Ports Authority, showed adverse effects even with the benefits of the larger flows in Cape Fear River. Discharge of untreated sewage in the City area results in scums and unsightly floating-solids along the water front. This pollution, when combined with the pollution from Carolina and Kure Beaches and the Southport Area, is such as to threaten the safety of valuable shellfish-areas near the mouth of the river, particularly under conditions of high river flows. Corrective action by the City and Riegel Paper Corporation is necessary if fishing in these commercial waters is to be preserved.

Smoke rooms and rest rooms, for workers on the loading docks at Sunny Point Army Terminal, have overboard flush-toilets that dump directly into the ship channel. In addition, most of the ships which are docked have overboard toilets. This problem, during the heavy loading-period from April to June, could be reduced by connecting the dock toilets to a shore sewage-disposal system.

The Town of Southport discharges untreated domestic-sewage into Cape Fear River near its mouth. This sewage adds to the pollution in the river from upstream sources and threatens the safety of valuable shellfish-areas near the mouth of the river. Shrimp and fishing boats discharge unwanted cargo, including spillage in the loading and unloading processes. Some of the fish and shrimp houses along the water front throw their waste overboard and have overboard toilets. The surface of the water around these areas become covered with floating solids, blood, and oil. A tighter control of activities to render the waste and use it for fertilizer or other usable products would result in a larger economical return and aid in removal of pollution from the surrounding waters.

CHAPTER X - WATERSHED MANAGEMENT

General - Information regarding water control; problems of watershed management; the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 2nd Session, approved August 4, 1954); the first annual National Watershed Congress (December 6 and 7, 1954); and the North Carolina Soil Conservation Districts Law, enacted by the 1937 Session of the General Assembly, may be found in Chapter XIII of "Water Resources of North Carolina, Department of Conservation and Development, 1955". The quoted publication comprises Volume I of a series of 11 volumes pertaining to the water resources of the State, of which the material herein, regarding the water resources of the Cape Fear River Basin, forms Volume VII.

Soil Conservation Practices Accomplished and Contemplated - The data, contained in the following tables of "Soil Conservation Practices Accomplished" and "Soil Conservation Practices Contemplated", were furnished by the State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina, for 23 counties, each of which lies wholly or partially within the area of the Cape Fear River Basin as indicated below:

Alamance	All
Bladen	Northeast 2/3
Brunswick	North 1/3 (corner)
Caswell	Southwest 1/6
Chatham	All
Columbus	East 1/8 (corner)
Cumberland	All
Duplin	All
Durham	Southwest 1/4
Guilford	All
Harnett	All
Hoke	Northeast 1/3
Johnston	Strip of Southwest Boundary
Lee	All
Lenoir	Strip of Southwest Boundary
New Hanover	North 1/3 (top)
Onslow	Strip of West Boundary
Orange	South and West 1/2
Moore	Northeast 3/4
Pender	All
Randolph	East 1/2
Rockingham	Southeast 1/3
Sampson	All

These 23 counties are included in nine Soil Conservation Districts as follows:

Soil Conservation Districts	Counties
Haw River	Alamance, Chatham, Guilford, and Randolph
Lower Cape Fear	Bladen, Brunswick, Columbus, New Hanover, and Pender
Dan River	Caswell and Rockingham
Cumberland County	Cumberland
Southeastern	Duplin, Lenoir, and Sampson
Upper Cape Fear	Harnett, Lee, and Moore

Soil Conservation Districts (Cont'd)	Counties
Neuse River	Durham, Johnston, and Orange
Pee Dee - Cape Fear	Hoke
Lower Neuse	Onslow

Because of the manner in which soil conservation districts were originally organized, some districts include only one county which may lie in one, two, or three river basins, whereas other districts may contain, wholly or partially, as many as five counties. For example, parts of Forsyth County lie in the Cape Fear, Roanoke, and Yadkin-Pee Dee River Basins; six of the 16 districts including one county, lie in two river basins; and eight and seven of the 37 districts, comprising the State as a whole, contain, wholly or partially, four and five counties, respectively. The records of the State Conservationist are maintained on a district, and on a county, basis. Consequently, when a county lies partially in one basin and partially in another, it was necessary for the State Conservationist to use estimates instead of actual accomplishments in preparing the tables. He feels sure, however, that the figures indicated on the two tables are accurate enough for all practical purposes.

The large number of district cooperators, shown on the table of "Soil Conservation Practices Contemplated", does not necessarily signify an unwillingness on the part of farmers in those counties to carry out soil conservation plans. On the other hand, it simply means that the small number of Soil Conservation Service technicians available in North Carolina have been unable thus far to work with all of these farmers. The State Conservationist hopes to reach them all as rapidly as possible.

Lyon Swamp-White Oak Swamp Watershed - This watershed lies between the Cape Fear and Black Rivers in the southeastern part of Bladen County and the southwestern part of Pender County. Two distinct problems exist in the watershed, drainage of the land itself and floodwater from the Cape Fear River. Crop losses, suffered as a result of insufficient drainage from 1900 to 1955, inclusive, are estimated at $1,089,000. Four Cape Fear River floods overtopped the levees of White Oak Swamp in 1908, 1928, 1945, and 1947, resulting in damage estimated at $160,100.

Approximately 14 miles of main drainage-outlets should be completely rehabilitated. This improvement would benefit about 6,000 acres of the watershed. Approximately 4.5 miles of the White Oak Swamp main drainage-canal should be renovated, and improved drain pipe and floodgates should be installed at the levee. About 2,000 acres would be benefited by this work. A lateral canal, 1.75 miles in length, is needed for the Back Swamp section of the White Oak Swamp watershed, and it is estimated that this canal would benefit an additional 600 acres.

In 1900, a levee was constructed across the upper end of White Oak Swamp to give some protection from overflow of the Cape Fear River. About two miles of canals were excavated, and a diversion was built to protect the lower six miles of Lyon Swamp. These improvements failed in 1908 when 50,000 acres, 2,600 of which were under cultivation, were flooded.

By 1912, the Lyon Swamp Drainage and Levee District was organized, and 13 miles of canals and 9,700 feet of levees were completed. The White Oak Swamp District had also begun improvements, and four miles of drainage canals were built. The year 1928 brought another flood which broke levees

SOIL CONSERVATION PRACTICES CONTEMPLATED

ITEM	UNIT	ALAMANCE	BLADEN	BRUNSWICK	CASWELL	CHATHAM	COLUMBUS	CUMBERLAND	DUPLIN	DURHAM	GUILFORD	HARNETT	HOKE	JOHNSTON	LEE	LENOIR	NEW HANOVER	ORANGE	MOORE	PENDER	RANDOLPH	ROCKINGHAM	SAMPSON	TOTAL
Closed Drains	Lin.Ft.	0	982,162	208,173	0	0	1,830,941	4,047,147	13,286,191	29,850	60,710	1,145,943	55,341	397,047	0	773,158	988,750	0	7,880	3,689,301	0	0	16,307,708	43,810,302
Conservation Crop Rotation	Acres	8,163	39,680	25,136	3,362	55,092	22,512	74,276	176,542	5,978	33,220	97,534	26,111	5,652	8,427	4,616	10,727	11,787	24,248	31,185	31,439	9,783	162,388	867,858
Contour Farming	Acres	5,192	8,723	11,382	4,299	55,440	2,999	27,827	55,126	12,596	59,577	85,996	16,225	7,204	14,563	1,354	400	15,383	9,467	7,215	41,949	12,739	50,867	506,523
Contour Stripcropping	Acres	10,790	1,795	358	2,670	47,157	0	7,498	16,979	3,589	20,817	42,150	7,696	3,744	5,472	184	1,000	18,461	5,740	1,000	4,688	8,776	13,230	223,792
Cover Cropping	Acres	32,818	29,403	12,140	3,873	11,157	8,391	37,021	185,562	13,962	50,422	42,450	7,300	9,647	12,781	5,059	11,055	27,509	16,186	34,598	32,159	7,341	160,318	751,152
Critical Area Planting	Acres	3,000	170	50	681	9,621	270	1,932	12,428	286	11,677	8,556	396	495	326	193	500	889	112	640	5,525	817	9,854	68,418
Crop Residue Utilization	Acres	1,800	11,315	7,990	1,536	19,463	6,883	43,790	183,990	5,412	99,063	47,823	13,759	10,224	13,243	4,213	10,947	22,499	20,849	26,500	5,788	1,965	163,067	722,119
Drainage	Acres	0	31,698	7,650	173	7,605	39,056	26,802	72,468	2,252	5,023	13,848	6,922	3,141	0	3,231	64,075	762	91	25,182	1,697	1,244	73,333	386,253
Group Enterprise	Miles	0	106	73	0	0	136	144	120	0	0	0	15	0	0	12	272	0	0	48	0	0	185	1,111
Group Enterprise	Cu.Yds.	0	26,600	140,000	0	0	1,224,566	1,795,000	1,004,200	0	0	0	103,200	0	0	83,172	1,712,288	0	0	336,000	0	0	890,011	7,315,037
Improvement Cutting	Acres	8,303	30,337	104,973	5,637	58,158	20,235	93,506	229,354	10,957	29,940	85,871	4,897	6,508	53,962	3,234	28,335	31,634	117,227	32,760	2,444	6,012	347,257	1,311,541
Open Drains	Miles	0	506	46	3	155	394	497	1,085	23	160	214	118	337	8	58	445	53	0	342	33	83	750	5,310
Open Drains	Cu.Yds.	0	5,155,957	320,780	17,000	275,900	2,513,431	586,260	8,944,214	1,230	956,962	1,160,065	847,718	2,496	2,500	60,883	3,170,286	153,316	0	2,718,513	116,371	192,668	678,597	27,776,044
Pasture Planting	Acres	20,359	12,296	3,399	1,580	39,625	6,101	11,716	32,054	2,958	4,260	16,634	2,320	1,729	6,905	510	1,119	4,987	2,825	14,717	17,935	5,051	25,755	234,835
Pond Construction	No.	1,280	210	16	134	596	85	930	122	278	478	3,167	93	21	0	39	14	486	1,106	540	851	206	200	10,852
Sprinkler Irrigation Systems	No.	145	277	25	103	57	80	435	1,396	19	157	0	247	15	196	54	87	83	211	622	549	229	460	5,427
Sprinkler Irrigation Systems	Acres	3,525	2,747	250	129	1,265	1,973	5,279	9,385	191	1,574	0	7,734	168	2,227	532	131	1,759	421	4,877	5,730	4,403	6,030	58,103
Terracing	Miles	2,999	35	19	358	3,373	74	552	783	739	2,804	374	43	390	3,147	19	0	2,405	158	73	2,255	818	402	21,777
Tree Planting	Acres	8,711	9,960	694	865	5,256	247	3,180	1,181	339	1,797	3,825	989	143	578	11	225	2,972	1,313	604	9,552	316	1,536	54,294
Waterway Development	Acres	840	25	31	296	867	47	200	473	104	3,536	3,624	394	36	471	21	25	437	732	91	1,960	672	343	15,225
Wildlife Area Improvement	Acres	337	506	126	88	1,933	44	933	842	20	5,568	2,542	80	0	473	12	132	223	1,579	745	4,183	724	372	21,374
District Cooperators	No.	1,707	3,175	1,749	2,118	2,100	5,338	2,513	5,266	223	3,158	4,268	1,193	6,713	909	3,067	111	427	1,502	1,707	2,715	3,287	6,155	59,401

SOIL CONSERVATION PRACTICES ACCOMPLISHED

ITEM	UNIT	ALAMANCE	BLADEN	BRUNSWICK	CASWELL	CHATHAM	COLUMBUS	CUMBERLAND	DUPLIN	DURHAM	GUILFORD	HARNETT	HOKE	JOHNSTON	LEE	LENOIR	NEW HANOVER	ONSLOW	ORANGE	MOORE	PENDER	RANDOLPH	ROCKINGHAM	SAMPSON	TOTAL
Closed Drains	Lin.Ft.	0	165,488	49,327	0	0	101,898	159,953	1,355,109	450	10,906	101,857	92,041	2,795	0	32,087	11,250	7,227	0	11,800	140,699	0	0	1,104,984	3,234,214
Conservation Crop Rotation	Acres	25,647	13,588	4,468	4,060	21,370	3,800	16,830	18,069	8,279	68,793	37,316	28,652	1,603	24,701	1,175	4,273	446	28,336	24,950	14,467	21,492	7,670	16,614	396,599
Contour Farming	Acres	28,618	1,460	23	2,824	20,143	153	3,203	2,388	3,116	39,901	34,271	5,894	326	17,318	158	0	57	23,528	29,708	558	8,350	6,365	13,629	241,991
Contour Stripcropping	Acres	706	25	0	85	1,056	0	658	629	251	2,805	480	774	54	268	13	0	1	1,461	2,855	0	828	1,340	970	15,259
Cover Cropping	Acres	13,780	7,353	2,268	3,552	13,429	3,984	8,479	9,049	2,246	34,655	5,695	15,644	541	20,305	733	3,945	233	14,752	8,414	11,054	8,657	6,528	18,684	213,980
Critical Area Planting	Acres	200	8	0	69	303	5	108	809	44	935	435	24	7	52	22	0	18	431	54	30	856	331	1,080	5,821
Crop Residue Utilization	Acres	6,775	5,161	1,835	918	10,643	2,738	1,797	10,620	2,385	17,409	6,180	11,290	284	19,987	1,578	4,053	207	7,064	11,959	4,500	7,398	4,633	15,935	155,349
Drainage	Acres	0	7,800	2,875	27	60	1,860	6,387	17,205	516	964	6,666	41,207	446	0	436	5,775	327	300	106	9,731	48	534	6,854	110,124
Group Enterprise	Miles	0	31	15	0	0	14	24	30	0	0	0	3	0	0	2	28	0	0	0	13	0	0	15	175
Group Enterprise	Cu.Yds.	0	201,129	128,392	0	0	127,446	197,911	197,800	0	0	0	17,664	0	0	17,948	253,825	1,590	0	0	72,122	0	0	115,571	1,331,398
Improvement Cutting	Acres	2,000	17,560	8,063	265	3,414	3,747	5,557	7,876	499	3,444	8,033	1,103	26	6,015	794	63,478	227	4,004	13,209	5,672	4,332	737	7,098	167,153
Open Drains	Miles	0	99	45	1	2	57	94	241	3	13	73	35	24	5	7	55	3	2	1	100	2	12	50	924
Open Drains	Cu.Yds.	0	569,289	314,020	3,000	1,555	225,986	436,816	1,285,786	8,820	21,950	133,535	592,838	2,940	0	39,117	349,714	12,609	1,124	3,310	559,487	8,156	17,332	321,403	4,908,787
Pasture Planting	Acres	6,516	2,440	1,092	1,000	9,034	526	3,149	5,274	2,352	17,134	6,263	2,608	185	3,831	172	1,881	88	6,944	1,638	4,523	4,925	3,476	3,001	87,992
Pond Construction	No.	778	188	35	33	939	39	634	139	214	1,274	839	80	29	353	8	36	1	234	476	75	240	164	240	7,048
Sprinkler Irrigation Systems	No.	75	17	0	4	10	5	161	77	15	73	0	16	1	31	2	13	0	13	56	20	8	29	40	666
Sprinkler Irrigation Systems	Acres	510	193	0	59	75	82	1,200	1,095	125	1,295	0	372	12	376	30	184	2	161	112	243	139	433	670	7,368
Terracing	Miles	1,055	7	1	213	820	8	32	148	381	2,499	1,580	137	48	416	2	0	1	439	1,028	27	793	881	88	10,604
Tree Planting	Acres	707	102	7	85	876	4	274	690	220	1,789	201	1,204	14	505	7	25	1	486	1,590	396	282	1,458	397	11,320
Waterway Development	Acres	334	13	2	176	179	2	1	57	193	1,019	476	98	24	245	5	0	2	463	130	26	75	1,103	172	4,795
Wildlife Area Improvement	Acres	160	68	58	17	163	6	349	81	69	1,603	170	136	0	59	4	68	0	66	355	103	94	54	118	3,801
District Cooperators	No.	1,239	498	419	933	877	984	557	642	313	1,610	1,063	542	1,384	746	714	290	581	796	1,035	574	903	1,115	1,062	18,877

and resulted in complete crop losses. This disaster and the depression of 1929 caused the farmers' interest to dwindle, and cooperative effort came to a standstill.

By 1943, interest had revived, and the Soil Conservation Service was working under memoranda of understanding with soil conservation districts. The Extension Service and the Soil Conservation Service jointly made a survey and prepared specifications for reconstruction and dredging of the Lyon Swamp Canal. Sufficient funds could not be obtained, and this project failed to materialize.

In 1945 and 1947, heavy floods breached the levees again, and repairs were made with the aid of the Corps of Engineers. The hurricanes of 1954 and 1955 inflicted severe damages to crops throughout the watershed, and landowners made another attempt to secure aid through their soil conservation district.

An application for planning assistance on the Lyon Swamp-White Oak Swamp Watershed, under the provisions of the Watershed Protection and Flood Prevention Act (Public Law 566), was submitted to the State Conservationist who published and distributed a report on a field examination of the watershed, conducted December 6-7, 1955.

The Lyon Swamp Drainage District was reorganized in November 1957 and employed a drainage engineer to conduct operations under the provisions of Section 156-54 to 134, inclusive, General Statutes of North Carolina.

Stony Creek Watershed - This watershed lies in the southwestern part of Caswell County and the northwestern part of Alamance County. The State Conservationist issued a notice, dated November 6, 1957, that this watershed had been approved, by the Administrator of the Soil Conservation Service, for planning assistance in accordance with Public Law 566 and requested interested agencies to provide rainfall records, streamflow measurements, hydrologic data, soil surveys, topographic information, present land use, and other related agricultural data.

CHAPTER XI - NAVIGATION AND FLOOD CONTROL

Navigation Projects - There are five navigation projects in the Cape Fear River Basin as follows: Black River, Cape Fear River above Wilmington, Northeast Cape Fear River, Smiths Creek at Wilmington, and Wilmington Harbor (otherwise known as Cape Fear River at and below Wilmington). Information regarding these projects is set forth below.

Black River - The project provides for clearing the natural channel and banks from the mouth at the Cape Fear River, 14 miles above Wilmington, to Clear Run, a distance of about 66 miles. The work was completed in 1895 at a cost of about $12,400. Water-borne commerce, consisting entirely of logs, totaled about 15,300 tons in 1948 and 6,600 tons in 1949. No commerce was reported for 1943-1946, or 1950-1955.

Cape Fear River above Wilmington - The project extends from the confluence with Northeast Cape Fear River at Wilmington, 28 miles above the mouth of the Cape Fear River, to Fayetteville, a distance of 115 miles. The project consists of a 25-foot channel with a minimum width of 200 feet from Wilmington to Navassa, a distance of about 4 miles, terminating in a turning basin about 400 feet by 550 feet; and a channel of 8-foot minimum depth between Navassa and Fayetteville, a distance of about 111 miles, obtained by three locks and dams and the dredging of river shoals.

Work on the shallow-draft channel and locks was begun in 1912 and finished in 1935; and the dredging of the 25-foot channel was completed in January 1939. The total cost of construction was about $2,339,800. Major improvement of the guard and guide walls was begun in 1953 and completed in 1955.

Average annual commerce on this waterway was about 520,400 tons for the period 1951-1955, of which fertilizer and fertilizer materials, averaging about 70,500 tons annually, were carried over the 25-foot channel. The remainder, 449,900 tons, consisting principally of pulpwood, logs, and petroleum products, was carried over the shallow-draft channel above Navassa. Commerce in 1955 totaled about 438,700 tons.

Northeast Cape Fear River - The original project for this river extended from the mouth of the Cape Fear River, at Wilmington, to Kornegays Bridge in Duplin County, about 5 miles west of Pink Hill. The project provides for clearing the natural channel for small steamers to Hallsville and for pole boats to Kornegays Bridge, 103 miles above the mouth. The lower 2.4 miles have subsequently been deepened and included in the project for "Wilmington Harbor". The natural channel was cleared in 1890-1896 at a cost of about $10,700. No commercial traffic was reported in 1950-1952, but 4,400 tons of logs moved over the waterway in 1953 and 1954, respectively. No commerce was reported for 1955.

Smiths Creek at Wilmington - This project provides for a channel, 12 feet deep and 100 feet wide, through the bar at the mouth of Smiths Creek, a tributary of Northeast Cape Fear River, 14 miles above Wilmington. The bar is about 0.6 mile above the Atlantic Coast Line Railroad bridge across the river north of Wilmington. The work was completed in 1937 at a cost of about $8,500.

Wilmington Harbor (Cape Fear River at and below Wilmington) - The project provides (1) for a channel, 35 feet deep and 400 feet wide, from the 35-foot contour in the Atlantic Ocean through the Ocean-bar Channel, thence 34 feet deep and 400 feet wide to the upper end of the anchorage basin (foot of Castle Street) at Wilmington, and thence 32 feet deep and 400 feet wide to Hilton Bridge

over the Northeast Cape Fear River, with increased widths at bends; (2) for an anchorage basin at Wilmington with a depth of 34 feet - 2,000 feet long, 900 feet wide at the upper end, and 1,100 feet wide at the lower end - with approaches, 1,500 feet long at the upper end and 4,500 feet long at the lower end, and with some widening of the transition channel at the downstream end; (3) for a turning basin opposite the principal terminals at Wilmington - 32 feet deep, 1,000 feet long, and 800 feet wide - with suitable approaches at each end; (4) for a channel, 12 feet deep and 100 feet wide in the Cape Fear River, from a point near the eastern entrance of the Intra-coastal Waterway to a connection with the main river-channel at a point about 3 miles above; and (5) for a channel, 25 feet deep and 200 feet wide, from Hilton Bridge over Northeast Cape Fear River to a turning basin, 25 feet deep and 600 feet wide, 1.25 miles above.

Deepening and widening the river channel to 32 feet by 400 feet, enlarging and deepening the anchorage basin and southern approach thereto, and deepening the ocean-bar to 32 feet, were completed to the foot of Castle Street in 1949. Dredging the 25 by 200 foot chennal and basin in the Northeast Cape Fear River above Hilton Bridge, and the 12 by 100 foot channel from the Intra-coastal Waterway to the ship channel in the river, were completed in 1948.

The project, as of January 1, 1957, was 87 percent completed. The ocean-bar channel was deepened to a depth of 35 feet during 1956. The river channel from the ocean-bar channel to the foot of Castle Street, as of January 1, 1957, was scheduled for completion to a depth of 34 feet by November 1957. A total of $4,353,800 had been expended on the existing project for new work. The estimated cost (1956) for remaining work was $1,543,000. No work has been done on the 32-foot project, on that portion of the river channel above Castel Street, except increasing the width of the turning basin, 30 feet deep, to 800 feet and widening the east side of the river channel, 30 feet deep, in the vicinity of the turning basin to the harbor line.

The average annual commerce for the period 1951-1955 amounted to about 4,288,000 tons, the principal commodities being petroleum products, fertilizers and fertilizer materials, logs, and pulpwood. Commerce in 1955 totaled about 4,690,000 tons. Modern terminal-facilities, constructed by the North Carolina State Ports Authority, were completed in 1952.

Flood Control Investigation - House Document No. 193, 73rd Congress, 2nd Session - This document contains the reports of the District Engineer, Wilmington District, the Division Engineer, South Atlantic Division, the Board of Engineers for Rivers and Harbors, and the Chief of Engineers, U. S. Army, on the improvement of the Cape Fear River for the purposes of navigation and efficient development of its water power, the control of floods, and the needs of irrigation. The following is quoted from the report of the Chief of Engineers, submitted on September 26, 1933, to the Secretary of War for transmission to Congress:

"The district engineer estimates that the average annual flood damages over a period of 42 years amount to about $116,000. He finds that protection of agricultural lands by the construction of levees is, in general, impractical because of high flood stages and narrow flood plains. One area of about 50,000 acres in the neck between Cape Fear and Black Rivers could be thus protected, but the cost would be excessive. The district engineer finds that the most promising means of reducing flood heights is by detention reservoirs and submits a plan for partial protection from floods of 10-year frequency by the construction of three reservoirs with an aggregate storage capacity of about 415,600 acre-feet. He estimates the first cost of this system at about $9,000,000, with annual

charges amounting to $680,000, which he compares with the average annual damages of $130,000 from a flood of this frequency, and concludes that the cost of protection by this plan is wholly incommensurate with the cost. . .

The district engineer presents a plan for coordinating power development with flood control. The plan utilizes all of the five power projects (Smiley Falls on the Cape Fear River at Lillington, New Hope at the confluence of Haw and Deep Rivers, Moores Mill on Haw River about four miles above this confluence, Bynum on Haw River about half way between this confluence and the junction of Haw River and Buttermilk Creek, and Mandale on Haw River about three miles above this junction), and provides for the same quantity of storage for flood control as that contemplated for flood prevention alone (Smiley Falls, New Hope, and Howards Mill on Deep River about half way between Moncure and Randleman), to be secured by construction of two flood-control reservoirs (Smiley Falls and Howards Mill) and raising one of the power dams (New Hope). Power would also be developed at one of the flood-control reservoirs (Smiley Falls). The power output would be about 360,000,000 kilowatt-hours, of which about 167,000,000 would be prime power. The district engineer estimates the cost of the combined plan at $30,067,000 and charges power development with $24,357,000. He estimates the average annual costs of power at $2,648,000 and of flood control at $116,000, respectively.

The district engineer concludes that irrigation is not necessary; that, until the market for power develops, increased production of hydroelectric power in the basin will not be economically justified; that power developments would be of little benefit to navigation; that the prevention of floods, either as a separate project or in conjunction with power development, is not economical; that floods cause no loss of life and that the benefits of flood protection are purely economic in nature and largely of local character; and that the needs of navigation will be fully provided for by the existing projects if modified as indicated. He recommends that there be no participation by the United States in flood control, power, irrigation, and navigation problems of the Cape Fear River and its tributaries beyond that provided by existing law and by the project recommended in House Document No. 789, 71st Congress, third session. The division engineer concurs in the conclusions and recommendations of the district engineer.

The reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors. (The Board was of the opinion that no further improvement of this stream for navigation in connection with power development, flood control, or irrigation, other than as provided for by existing projects and as recommended in House Document No. 786, 71st Congress, third session, should be undertaken by the United States at that time.)

After due consideration of the above-mentioned reports, I concur in the recommendation of the Board of Engineers for Rivers and Harbors. . ."

Flood of 1945 - Damages estimated at $4,700,000 were suffered all along the Cape Fear River, exclusive of damages along its tributaries. Official figures show that a flood crest of 68.9 feet was reached at Fayetteville, with at least 25 percent of the city being under water, including 1,200 to 1,500 homes. Raw sewage was cast up into the streets and constituted a major health-hazard to both the citizens of Fayetteville and the troops at Fort Bragg. As a result of the flood, the public water-supplies of Burlington, Dunn, Erwin, and Randleman were cut off completely. A total of 150,000 acres of rich farm-land were inundated in the Cape Fear River Basin between the confluence of the Deep and Haw Rivers and the City of Wilmington.

A flood of like degree, occurring in the future before adequate flood-control measures have been provided, would cost many millions of dollars more than the flood of September 1945, because of the industrial development, increase in population, and general increase in property valuations in the Cape Fear River Basin during the years of 1947-1956, inclusive.

Action during 1946-1954, inclusive - The Committee on Flood Control, House of Representatives, U. S. Congress, adopted a resolution, in May 1946, directing the Board of Engineers for Rivers and Harbors to review the prior reports of the Chief of Engineers on the Cape Fear River with a view to determining the feasibility of improvements for flood control, drainage, and other purposes in the entire Cape Fear River Basin. At a public hearing on the review, held by the District Engineer, Wilmington District, in Fayetteville in September 1946, local interests expressed a desire for control of floods in the Cape Fear River and its upstream tributaries.

Filling the breaks, caused by the September 1945 flood, in about 5 miles of dike on the left bank of the Cape Fear River near Lock and Dam No. 1 (about 5 miles southeast of Kelly in Bladen County) was completed, in May 1947, at a cost of $36,500. These dikes were constructed by local interests about 1910. Subsequent maintenance and general extension have been performed by the North Carolina State Highway and Public Works Commission.

The District Engineer submitted a preliminary-examination report on the investigation authorized in May 1946, recommending that a detailed survey be made. The survey was authorized, and funds therefor were made available. The District Engineer investigated various plans of improvement, including levee works, channel works, flood-control reservoirs, multi-purpose reservoirs, and combinations of these methods. Most of the field work was completed. Economic analysis and structural features of the proposed improvements were not fully determined.

No work on the survey was done during 1950-1954, inclusive. Its completion was deferred for lack of funds in the examinations and surveys program of the Chief of Engineers because of the Korean War and other reasons. Funds in the amount of $73,600 had been expended on the preliminary examination and the survey.

The uncompleted survey report contemplates the erection of four dams, one on the Cape Fear River and three on its tributaries. The largest dam would be on New Hope River about 2.5 miles north of Moncure in Chatham County and near the confluence of the New Hope and Haw River. The other three dams would be located on Deep River near Randleman in Randolph County, on Deep River at Howards Mill in the northeastern corner of Moore County, and on the Cape Fear River at Smiley Falls in Harnett County near Lillington.

As originally contemplated, the first three of these dams would serve both flood-control and hydroelectric-power purposes, and the fourth, Smiley Falls, would be useful for water power but would have little or no flood control value. It is understood that it would be uneconomical to try to develop the relatively small electric power potential of these four projects, totaling an estimated 61,000 kilowatts, compared with what their cost would be if constructed for that purpose.

Although flood control in the Cape Fear River Basin is important in considering the justification for the dams under consideration - since, for example, erection of the New Hope dam alone would drop the crest of a flood like the one in September 1945 by 10 feet at Fayetteville, enough to protect this populous

town and area, including Fort Bragg, from serious flooding - other considerations of vital modern-day importance have become urgent in recent years.

The construction of the four dams could be of great benefit to the State in terms of increasing public and private water supplies, providing farmers in the basin with water for irrigation, and making public recreation available. The water situation in North Carolina has reached emergency status within the last few years. In 1954, the severe water shortage resulting from the drought cost the State 100 million dollars, half of it to agriculture, alone, in reduced crop yields. Municipalities in or close to the Cape Fear River Basin have been particularly hard hit during the last eight years - with serious public emergencies involving drastic water rationing affecting homes and industries in Burlington, Winston-Salem, Greensboro, Raleigh, Pittsboro, Sanford, Mount Olive, Windsor, Mocksville, Reidsville, Thomasville, Lexington, Cary, Candor, Mount Pleasant, Roxboro, Mebane, Goldsboro, Selma, Apex, Ramseur, Biscoe, and Wilson - 23 cities and towns with a total 1950 population of 367,290.

A number of these municipalities are looking around in desperation for new supplies of water to tap, to meet not only future but present needs for their citizens and industries, many of whom could conceivably be served by the reservoir under consideration by the District Engineer.

In addition - and this is of great importance in a state in which two-thirds of the population live outside of incorporated communities and depend in the main on wells for their water supply - the impoundment of water in these proposed reservoirs would have a very beneficial effect on the water table in the area surrounding them.

In 1900, North Carolina had a population of about 2,000,000 people, and the average North Carolinian was using about 50 gallons of water per day. At the present time, the State's population is over 4,000,000, and the daily per capita use of water is nearly 200 gallons. This increase from 200 to 800 million gallons of water per day shows a trend which may be expected to continue. Timely action must be taken to meet the needs of the people for water.

In recent years, interest in irrigation has increased greatly in North Carolina. The number of farm irrigation systems increased from 30 in 1944 to 1,500 in 1954. During the same period, the acreage under irrigation increased from 400 to 17,850 acres.

The importance of public recreation to health and welfare has been increasingly recognized in the last few decades. The recreational benefits of the four reservoirs under consideration would be particularly important, because the areas in the vicinity of these reservoirs are heavily populated and the people in these areas are far removed from the attractions of the lakes in the western part of the State and from the beaches and waters of the eastern seaboard.

Action during 1955, 1956, 1957, and 1958 - Funds in the amount of $21,400, for continuing the survey, were included in the 1955 Public Works Appropriation Act. The District Engineer, as soon as practicable after receipt of these funds, made arrangements to hold a public hearing for the purpose of obtaining the views of local interests regarding proposed improvements. In his notice, dated January 4, 1957, of a public hearing to be held at Fayetteville on February 8, 1957 regarding the Congressional resolution hereinbefore indicated, he stated that he had been directed to make a preliminary examination and survey of Cape Fear River for flood control. The following is quoted from the public notice.

"The authorization calls for a review covering the entire Cape Fear

Basin. However, because of limited funds and time, the preparation of an interim report covering the Cape Fear River below a proposed reservoir on the Haw and New Hope Rivers has been authorized, deferring studies on the remainder of the basin to a later time. The current study is therefore limited to the consideration of improvements at and below the proposed reservoir and the benefits which would accrue from such improvements. Benefits to be evaluated include reduction in flood damage, increased land usage, power development if justified, pollution abatement, increased low water flow, fish and wildlife benefits, recreation, and water supply.

Improvements under consideration include a dam and reservoir on Haw River below the mouth of New Hope River and local protection works at Fayetteville and near Kelly, Bladen County. A dam and reservoir at Smiley Falls on the Cape Fear River (near Lillington), to use the regulated flow that would result from the construction of a reservoir on the Haw River, is also under consideration.

A map is attached showing the location of the reservoir that would result from a dam at the New Hope site on Haw River. The maximum reservoir that it would be feasible to provide would have a pool elevation 106 feet above the stream bed at the dam or 260 feet above mean sea level. The reservoir would have a capacity of 1,450,000 acre-feet and, at maximum pool-elevation, would inundate 49,400 acres of land. It is estimated that the reservoir would provide partial or complete protection on about 200,000 acres of land, that it would reduce flood stages from a flood similar to that of September 1945 by 9 feet at Fayetteville, and that it would reduce flood damages in the area below the reservoir by 85 percent. A reservoir, having a pool elevation of 260 feet above mean sea level, would also develop power, provide for water supply, provide pollution abatement below the dam, increase depths in the navigation pools below Fayetteville by about 1 foot, and provide a permanent pool having an area of 14,600 acres.

The minimum reservoir that would provide adequate flood control would have a pool 85 feet above the stream bed or at 239 feet above mean sea level. Such a reservoir would have a capacity of 630,000 acre-feet and, at maximum pool elevation, would inundate 30,200 acres of land. It would have a small permanent pool but otherwise would provide the same amount of flood protection as for the reservoir described in the preceding paragraph. . ."

At the public hearing, the Cape Fear Basin Development Association presented data regarding flood damages in the Cape Fear River Basin below the confluence of Haw and Deep Rivers and strongly advocated the improvements under consideration by the Corps of Engineers. Several residents of the Deep River Basin advocated construction of flood control dams at Howard Mills and near Randleman in Randolph County. A citizens-group, known as the New Hope Valley Association, insisted that a series of small dams and reservoirs would effectively control the waters. The association opposed the proposed dam and reservoir on Haw River below the mouth of New Hope River on the grounds that valuable farm land above the dam would be sacrificed for the benefit primarily of the lower valley. A representative of the North Carolina Grange recommended that a report of the Soil Conservation Service, on the feasibility of providing needed flood control by means of floodwater-retarding structures, be forwarded to Congress with the report of the Corps of Engineers.

Joint Study of the Cape Fear River Basin - The following is quoted from an article in the "News and Observer", Raleigh, North Carolina, dated June 26, 1957:

"A joint study looking toward a comprehensive development program of

water resources in the Upper Cape Fear River Basin will be undertaken by the U. S. Corps of Army Engineers and the Soil Conservation Service, Senator W. Kerr Scott announced today.

The State of North Carolina will be requested to assist with the study, which is expected to result in a preliminary plan covering both flood control and water conservation projects in the upper basin lying above the confluence of Haw River and New Hope River, the Senator said.

Meanwhile, Scott said, the engineers' report on the proposed New Hope reservoir will be held up pending completion of the new study which is expected to be finished by early next year.

In announcing the study project, Senator Scott said this is an 'unprecedented' approach to a water development program, since never before have the Soil Conservation Service and the Corps of Engineers worked together during the preliminary plans for such a program. . .

The Administrator of the Soil Conservation Service proposed that the Governor of North Carolina be invited to designate a representative to participate in the studies. The Administrator further suggested that the State Conservationist be asked to participate in a meeting to plan for the joint investigation, along with representatives of the Engineers' Washington Office and the engineering and watershed planning unit of the Soil Conservation Service at Spartanburg, South Carolina. . ."

Joint Land and Water Resources Study Committee - This committee, comprising representatives of the Administrator of the Soil Conservation Service, the Chief of Engineers, Department of the Army, and the Governor of North Carolina, was organized at Wilmington, North Carolina, on July 9, 1957. The committee, known originally as the Haw River Joint Land and Water Resources Study Committee and later as the Upper Cape Fear River Joint Land and Water Resources Study Committee, agreed that the study would be conducted by personnel assigned from the staffs of both the Corps of Engineers and the Soil Conservation Service as well as personnel from State agencies, working under the direction of the Committee. It was further agreed that the objective of the study would be the preparation of a generalized plan for the comprehensive development of the water and land resources of the Haw River Basin and a report which would provide the basic framework under which the Corps of Engineers and the Soil Conservation Service could proceed with preparation of reports on specific projects for authorization. It was also agreed that work on the study would get under way immediately and that submission of the report on the proposed New Hope Reservoir would be deferred pending completion of pertinent phases of the joint study.

Work Group of the Committee - The Work Group of the Joint Land and Water Resources Study Committee, comprising representatives of the Soil Conservation Service, the Corps of Engineers, the U. S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina State Stream Sanitation Committee, and the North Carolina Department of Conservation and Development, held five meetings during the period September 5, 1957 to January 6, 1958, inclusive. Statements in a press release after the meeting on January 6, 1958 are set forth below.

"Studies of the municipal, industrial, and agricultural water supply and a flood-damage survey of the Cape Fear River Basin below the confluence of the Deep and Haw Rivers have been accomplished. The Haw River Basin flood-damage survey will be finished within two weeks.

Three sample areas for possible reservoir sites have been selected for detailed study. However, delay in receiving aerial-photograph coverage of one sample area has held up planned field surveys and selection of the reservoir sites. Completion of these surveys and hydrological and geological investigations of dam sites is expected by the end of this month.

Other elements to be investigated include economic studies involving annual benefits, annual costs, and allocation of costs covering recreation, flood control, fish and wildlife, pollution abatement, and water supply of the Haw River Basin.

In reviewing the work accomplished as compared with the work plan, determination was made that it is proceeding according to schedule.

At the conclusion of the study, a report will be prepared providing a framework by which the Corps of Engineers and the Soil Conservation Service can make specific recommendations for authorization."

The Department of Conservation and Development, as a member of the Work Group of the Joint Land and Water Resources Study Committee, submitted, to the District Engineer, Wilmington District, data regarding present and future requirements for municipal and industrial water-supply, plans of municipalities to meet future requirements in the Upper Cape Fear River Basin, and data regarding the amount of water now being taken from the Cape Fear River Basin and the anticipated amount to be used during the next fifty years with the proposed New Hope Project in operation, on August 28, 1957, December 30, 1957, and March 21, 1958, respectively.